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ABSTRACT

This report provides a summary of the 2-year IVSET (Interactive Videodisc for Special Education Technology) project which refined microcomputer and videodisc system hardware, produced instructional packages, and investigated the system effectiveness. These activities built on the achievements of a pilot project which had developed a preliminary microcomputer videodisc system and an initial prototype instructional package for self-paced, individualized instruction for handicapped students. The report specifically discusses project objectives and activities; hardware and software systems; the instructional programs for time-telling, coin identification, word recognition, directional prepositions, and beginning sight reading; videodisc production and programming processes; IVSET staff experiences in producing interactive videodisc programs; and field test results. Nineteen dissemination presentations and publications are listed. Appendices contain the user's guide to the microcomputer/videodisc system; objectives, prerequisite skills and script samples for the instructional programs; information on the installation and operation of the light interrupt touch panel; and a description of a system for the development and presentation of interactive videodisc instruction. Thirty tables and figures are provided. (LMM)

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INTERACTIVE VIDEODISC FOR SPECIAL EDUCATION TECHNOLOGY

FINAL REPORT

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The IVSET Project wishes to thank and acknowledge the U. S. Department of Education, Office of Special Education who made this project possible. Special thanks to Ms. Barbara Dempsey who patiently answered all our funding questions and arranged a badly needed time extension; and special thanks to Dr. Paul Anderek, the Project Officer, for his advice and continued support.

For further information contact:

Ron J. Thorkildsen
UMC 68
Exceptional Child Center
Utah State University
Logan, UT 84322

Alan M. Hofmeister
UMC 14
School of Graduate Studies
Utah State University
Logan, UT 84322

Kim E. Allard
UMC 68
Exceptional Child Center
Utah State University
Logan, UT 84322

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I. INTRODUCTION

Providing self-paced individualized instruction to handicapped has long been hampered by a shortage of trained personnel and overwhelming personnel costs. The use of computers and computer-assisted instruction (CAI) has been viewed as a promising approach to providing cost effective individualized instruction. However, the major limitation of traditional CAI has been its prerequisite of reading skills. The videodisc with its random access video and audio capability can provide high quality, real life images as well as spoken instructions. When combined with an external microcomputer to give it directions, the videodisc can provide an "intelligent" and highly interactive instructional environment.

Early in 1979, Utah State University (USU) purchased a prototype videodisc player. A pilot project resulted in a preliminary microcomputer/videodisc system. An interface board and necessary software were developed to allows the videodisc to be controlled by microcomputer, and a light interrupt touch panel was designed to allow learners to input information by touching the television screen. Finally, a prototype instructional package on matching shapes, sizes and colors was produced.

Based on this pilot project, the Exceptional Child Center at USU responded to a request for proposals from the Bureau of Education for the Handicapped, Media and Captioned Films Division. Funds were subsequently received to: 1) further refine the microcomputer/videodisc system hardware; 2) to produce additional instructional packages; and 3) to investigate the effectiveness of this type of instructional system. This two-year project (G007904510) began October 1, 1979 and was titled the Interactive Videodisc for Special Education Technology (IVSET) Project. The following is a summary of the major activities and conclusions of the IVSET project.

Overview of Project

The first year of the project was devoted to completing and field-testing the Matching Shapes, Sizes and Colors program, modifying the hardware components of the system, revising computer software and producing and field-testing three additional instructional packages. During the second year, three additional instructional packages were developed and field tested, a computer software authoring system was completed and documented, the hardware components of the system were futher refined and dissemination activities were increased.

II. FIRST YEAR OBJECTIVES AND ACTIVITIES

Objectives for the project's first year included:

Objective 1: Revise the entire IVSET system, i.e., hardware, software and courseware, based on data obtained from the Exceptional Child Center's pilot project preliminary field test.

Objective 2: Develop Time Telling package for the IVSET system.

Objective 3: Develop Functional Word Recognition package for IVSET system.

Objective 4: Develop Coin Identification package for the IVSET system.

Objective 5: Develop and document a preliminary user's manual.

Objective 6: Field test additional instructional packages developed in the first year of the project.

Activities undertaken in completing each of the objectives are outlined below.

Objective 1. Revise the entire IVSET system, i.e., hardware, software and courseware, based on data obtained from the Exceptional Child Center's pilot project preliminary field test.

Hardware Modification

1. A second floppy disk drive was added to the IVSET system in order to provide sufficient storage for the large amounts of data to be collected, as well as for the information necessary to run highly interactive programs.
2. A Mountain Hardware clock card was implemented in the system, in order to maintain data, including length and date of student sessions, latency of responses, and time allowed for responses.
3. An additional computer circuit board referred to as a language card was added to the system to allow the use of the Pascal language for computer software development.

4. The interface board which allows the microcomputer and videodisc to communicate was redesigned to include a switch that allowed the video to be used from the microcomputer to the videodisc selectively.
5. The touch panel system was modified to have 1/4 inch resolution instead of 1/2 inch resolution, which the earlier version had. This touch panel was imbedded in the front of the television monitor. This modification greatly reduced the bulk of the system by eliminating the large box the original touch panel was housed in.
6. A video processor board was added to the system to allow overlaying computer generated graphics on the videodisc video image.

Software Modification

1. Computer programs required to collect data and monitor learning progress in the Matching Shapes, Sizes and Colors package were completed and implemented.
2. Existing computer programs which allow the microcomputer and videodisc player to present an instructional package were rewritten using the U.C.S.D. Pascal computer language. Originally, the computer programs were written in Applesoft BASIC. The decision to change to Pascal was based on two premises. First, execution speed would be improved by using UCSD Pascal, and second, the highly structured naure of Pascal allows for simpler revision of the software. This was very important based on the number of anticipated development and revision cycles of the software.
3. The authoring system concept for videodisc programming was conceived and preliminary authoring system designed. The authoring system allows a non-programmer to maintain control over programming an instructional videodisc package.

Courseware Modification

1. All 21 lessons of the Matching Shapes, Sizes and Colors were revised, based on information gained during the pilot project.

Objective 2. Develop Time Telling package for the IVSET system.

The Time Telling package was adapted for interactive videodisc use from a paper and pencil version of a Time Telling Program. The paper and pencil package is a product of the Exceptional Child Center's Outreach and Development Division (Hofmeister, 1975). Objectives and prerequisites for the instructional program were defined and three review and revision cycles were conducted in preparing the final videodisc script. In addition, an external consultant was retained to provide additional feedback on the presentation of the instruction.

A clock face was constructed and a hand puppet rather than a person was used as the instructor in the program. Necessary personnel to operate the puppet and produce the audio were hired. Additional video segments to be used for positive feedback were procured, and the script was modified for placement on the videodisc. Both audio tracks were used whenever possible to save valuable space on the videodisc. The instructional program was videotaped on 1" videotape in the television production studios at Utah State University. After editing, the videotape was reviewed, the script revised and the videotape revised. The videotape was sent to DiscoVision Associates for conversion to a videodisc. The videodisc was returned in 8 weeks. A more detailed description of the videodisc production is contained in Section VI.

While the videodisc was being manufactured, the instructional designer began the actual programming process. Detailed flowcharts had already been completed to assure that the final videodisc would indeed

have all the necessary instructional, remedial, and feedback segments. From the flowcharts, the instructional designer began filling out programming forms. Upon receipt of the videodisc, the instructional designer completed the programming forms, the data were entered into the system and stored on a floppy diskette and the instructional program was debugged. For an indepth description of the videodisc programming process, see Section VIII. For a more detailed description of the Time Telling Program see Appendix B.

Objective 3. Develop Functional Word Recognition package.

Objectives and prerequisites for the program were defined and three review and revision cycles were conducted in preparing for the final videodisc script. An existing word recognition package (Hofmeister, 1976) was used as a basis for the videodisc package, however, several additions were made to the package to investigate the additional options made available by use of the microcomputer/videodisc system. Both video from the videodisc and computer generated text were used in the instruction. This instructional program was produced on 1 inch helical scan videotape and sent to DiscoVision Associates for disc production as well. The same programming procedures described in Objective 2 were followed for this program. For a more detailed description of the Functional Word Recognition package, see Appendix D.

Objective 4. Develop Coin Identification Package.

The Coin Identification package followed the same development sequence as the two previously described packages. The instructional sequence was modified based on a paper and pencil version of the program distributed by the Exceptional Child Center's Outreach and Development Division (Hofmeister, 1977). The program required using only video and audio from the videodisc.

A puppet was used to provide instruction. The program was produced on one inch helical scan videotape and sent to DiscoVision Associates for videodisc production. The same programming procedures described in Objective 2 were used to produce the computer software for the Coin Identification program. For more detailed information on the Coin Identification program see Appendix C.

Objective 5. Develop and Document User's Manual.

A preliminary version of the user's manual was developed in the first year of the project to use in the field-test of the Time Telling, Coin Identification and the Word Recognition programs. This version of the manual consisted of:

1. A detailed set of instructions to set up the system.
2. System operation instructions.
3. A system troubleshooting guide.

Three subjects, with no experience with the videodisc system, evaluated the system set-up and operating instructions. The information from the evaluation was used in improving both the system operation and the user's manual.

Objective 6. Field test additional instructional programs developed during the first year of the project.

The Time Telling, Identification of Coins, and Functional Words programs were field tested at the Utah State Training School at American Fork, Utah. An additional field test of the Time Telling program was conducted in an elementary resource room in Logan, Utah. These field tests are described in Section IX.

III. SECOND YEAR OBJECTIVES AND ACTIVITIES

Objectives for the second year of the project included:

1. Revise the hardware and software components of the IVSET system based on the data obtained from the first year's field test activities.

2. Complete three or more instructional packages for use with the IVSET system.

3. Develop a management plan and support materials for implementing the IVSET system in an educational setting.

4. Develop a hardware maintenance manual.

5. Develop a manual which describes the authoring system designed for programming interactive videodiscs.

6. Field test the second year's instructional packages for instructional and cost effectiveness.

Activities undertaken to complete the second year objectives are described below.

Objective 1. Revise the hardware and software components of the IVSET system based on the data obtained from the first year's field test activities.

Hardware Modification

1. The original USU printed circuit interface was eliminated from the system and replaced by the commercially available version of the same board produced by Coloney Productions of Tallahasee, Florida. This interface was later replaced by an interface available from Allen Communications of Boulder, Colorado, which provided additional capabilities.
2. The serial interface board which was used to control the touch panel was removed from the system. This was possible because of an RS232 port on the Allen Communications interface.
3. A decision was made to discontinue the use of the video processor board which allowed for overlaying computer generated text on graphics over the video image from the videodisc player. The decision to stop using the board was based on the following:

a. The board was built as a prototype wire wrapped board and its performance was unreliable. The company which produced the board then provided a printed circuit board with even more reliability problems. The heat the board generated seemed to be a factor in the number of equipment malfunctions experienced in the field test at the Utah State Training School. Consultation with others using this board confirmed our conclusions.

b. The quality of the overlayed image was extremely poor. It consistently shook and literally swam on the television screen.

c. Cost for the board would have been approximately $2,000. (This board was borrowed from another project). Project staff felt this price would make the system prohibitive in any type of instructional setting.

Software Modification

1. The question parameter file or the method of storing information specific to each instructional package, i.e., starting and ending frame numbers, correct coordinates, question numbers, etc., was revised extensively. The original files were set up to provide a standard amount of storage for each individual segment of instruction or testing. After the first set of programs were developed, it was determined that as much as one-third of the space allowed in the files was left unused. Because the space required varied among questions, variable length data files were set up. This was expected to cut down on the number of program control diskettes necessary to run each program.

2. A refined question numbering system was developed and implemented in order to simplify the data collection and reporting procedures. The system consists of 5 or 6 digit segment numbers which include infor-

mation on the objectives referred to, the sequential appearance of the segment within the objective and an identifier which identifies the segment as a test of alternative instructions item.

3. The report generating system was given a general overhaul. Provision was made to allow the teacher to utilize report generating procedures directly following the student session or after the student's session.
4. A massive undertaking was the design and implementation of a refined teacher/user prompting system. Data colledted from the Woodruff School field test provided a framework from which the revised prompting system was developed. Errors often made in system operation were identified and instructions simplified. The operating system was organized in a Main Menu format. This allowed the teacher to select all possible operational options from a single screen display. After selecting each option, the teacher is prompted through each activity. Particular attention was given to making the system forgiving to the novice user. For more information on the teacher/user and prompting system, see the USER'S GUIDE TO THE MICROCOMPUTER/VIDEODISC SYSTEM in Appendix A.

Objective 2. Complete three more instructional packages for use with the IVSET systems.

Instructional programs developed in the second year of the project included Beginning Sight Reading 1, Beginning Sight Reading 2 and Directional Prepositions. Package development took a different approach in the project's second year based on experience gained from the development and field testing of the first set of instructional packages. First, it was determined that although space on the videodisc was a necessary consideration in package development, it should not be a major criterion. This decision was partially based on technological advances which hopefully will soon provide more audio space

on the videodisc with which to work. Secondly, more appropriate feedback and motivation video segments were desired. Combined with this was the notion of a more linear flow; that is as long as the student is making correct responses s/he will continue in a linear mode. Branching generally occurs only when an incorrect response has been made. A third decision made was to discontinue the use of puppets as instructors. This was based in part on the difficulty involved in using puppets, but also on a perceived need for a more personalized approach to the instruction.

Instructional programs developed in the second year were not modified from existing programs. Target audiences were identified and existing packages reviewed. Based on what was currently available, objectives were written for each of the programs and prototype scripts written. The prototype version of each program was pilot tested with children at the Exceptional Child Center. An external consultant was retained for a final review of the programs before videotaping.

In planning for the programs, one question was continually raised. Given the expense of videodisc space and the amount of space taken up by remedial segments, the issue of how much remediation to provide received a great deal of attention. A review of the literature did not yield any helpful generalities in the amount of remediation used in computer assisted instruction. A proposal was made and accepted by the Office of Special Education to produce two versions of the sight reading program. One version of the program would utilize maximum remediation as determined by the instructional designer. A second version of the program would include a minimum amount of remediation. The results of the two versions of the program would then be compared. For more information on the second year's instructional programs, see Section V.

Objective 3. Develop a management plan and support materials for implementing the IVSET system in an educational setting.

The management plan for implementing the IVSET system consists of two components: a user's manual and a hands-on teacher training component. The user's manual entitled USER'S GUIDE TO THE MICROCOMPUTER/VIDEODISC SYSTEM is the backbone of the management plan. The manual is designed as both a training or tutorial tool and a reference source. The manual consists of the following sections.

1. Equipment set up and system operation.
2. Information on handling floppy diskettes.
3. An overview of the daily operation of the system.
4. A detailed description of the system operation options, what they are used for and how they are used.
5. A section on teaching students to work with the IVSET system.
6. A question/answer unit on integrating the system in an educational setting.
7. A guide to trouble-shooting the IVSET system.
8. Objectives and prerequisites for each instructional package.
9. A user's reference sheet for posting near the system.

The second component of the management plan was the training section. An hour long training session was devised which included stepping the teacher through the operation of the system in a hands-on approach. This tended to quickly build confidence in using the system. In addition, because the user's guide provided the framework for the training, the teacher's quickly became familiar with the manual.

IV. THE IVSET SYSTEM

Description of Hardware

The IVSET microcomputer/videodisc system consists of the following components:

1. an Apple II microcomputer with 48K random access memory (RAM), an Apple Disk II Controller card with two floppy-disk drives, and a language card;
2. a Sony Trinitron 12 inch color monitor that has been modified to house a Carroll Manufacturing Company light-interrupt touch panel (see Appendix H for touch panel documentation);
3. an Integral Data Systems Paper Tiger 460G printer interfaced through an Apple Parallel Interface card;
4. a DiscoVision Optical Videodisc Player, Model 7820-3, controlled by an Allen Communication VMI card (the VMI card also acts as the interface to the Apple microcomputer for the touch panel);
5. a Mountain Hardware Clock card.

The expansion slots in the Apple II Plus microcomputer are used in the following configuration:

slot 0 - Apple Language card

slot 1 - Apple Parallel Interface card

slot 2 - Mountain Hardware Clock card

slot 3 - Allen Communication VMI card

slot 6 - Apple Disk II Controller card

The figure contained on the following page shows a diagram of the IVSET System Component.

IVSET System Component Diagram

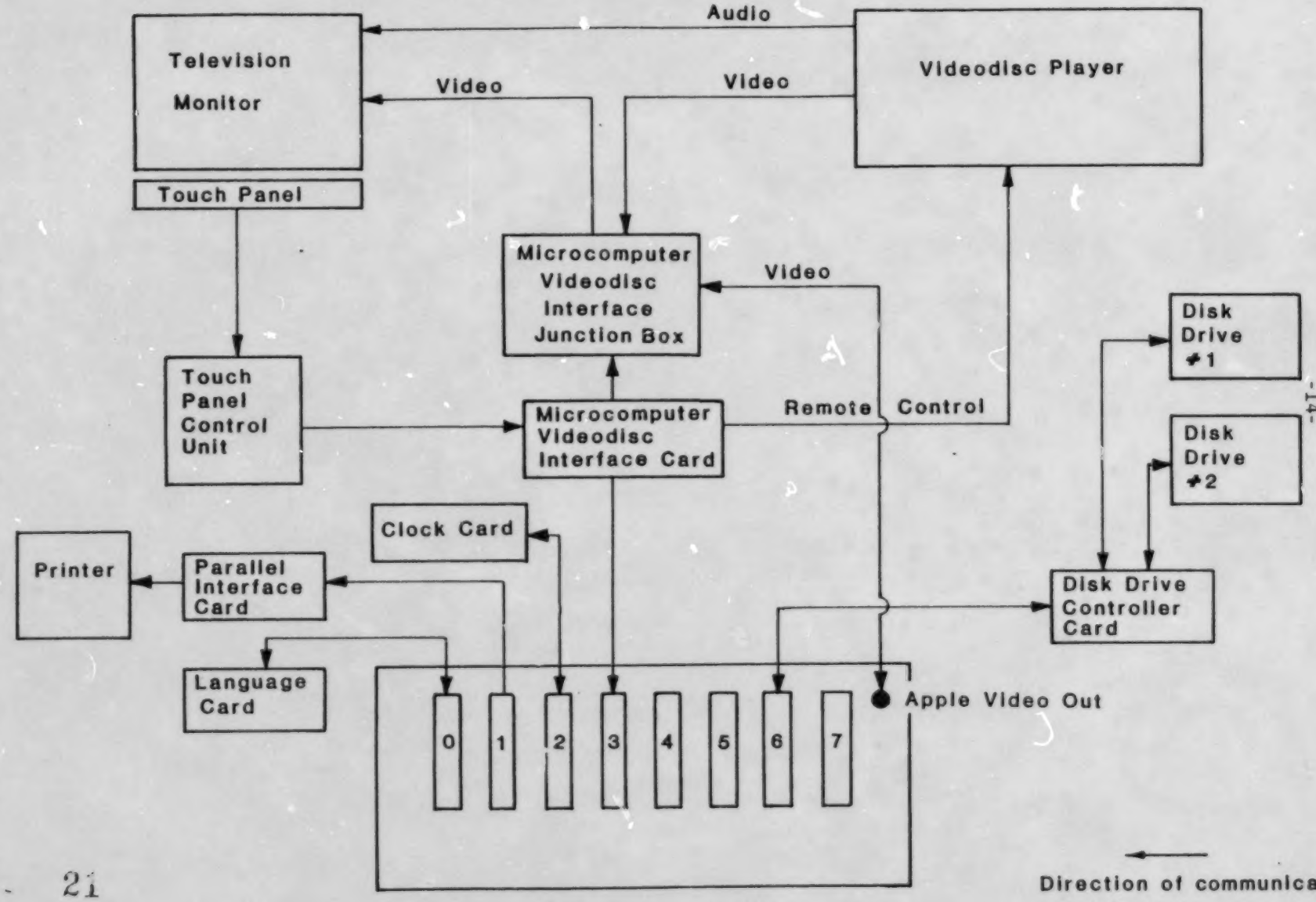

Figure IV.1 IVSET System Component Diagram.

Description of Software

The software for the IVSET microcomputer/videodisc system was developed using Apple Pascal, Release 1.1 Additional program support was developed in Apple 6502 Assembly language. The computer software includes customized programs which control the microcomputer/videodisc system as well as utility programs used in instructional package development.

The programs which control the videodisc are designed to allow the instructional developer a high degree of flexibility in presenting instruction. The instructional features of the programming software include the following:

1. The video image can be paused after an instruction for a length of time determined by the programmer.

2. An audio sound can be built into the program to call for assistance when encountered.

3. Test items can be identified and responses monitored to determine whether or not a mastery level set by the programmer is achieved.

4. A length of session monitor can be initiated to end each session after a length of time predetermined by the teacher.

5. Coordinates for incorrect answers can be stored to provide specific feedback on incorrect responses.

6. Data maintained on student progress includes:
   - starting question number
   - ending question number
   - number and percent of items correct
   - number and length of student session
   - number of times the student did not respond to an item
   - number of times the program signalled for assistance

7. A response length feature can be initiated by the teacher to allow the student a given number of seconds to respond to an instruction.

8. The programmer may vary the number of incorrect responses allowed on each question.

9. The programmer can toggle the video to either present video from the videodisc or a blank screen.

10. Graphical and summary formats are available for student progress reporting.

In addition to presenting instruction, the IVSET software is designed to provide several utilities for the teacher/user. These utilities are all contained on the master control diskette for each package and accessible through a main menu appearing each time the system is booted (see Figure IV.2)

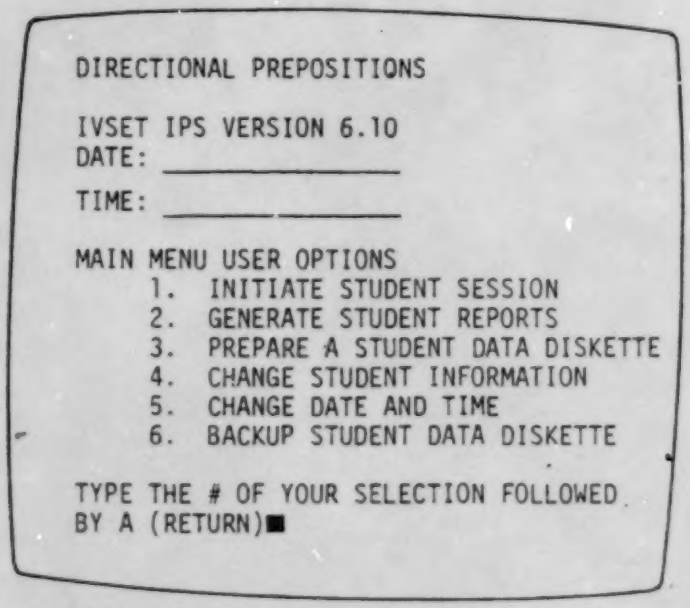
DIRECTIONAL PREPOSITIONS
IVSET IPS VERSION 6.10
DATE: _____
TIME: _____
MAIN MENU USER OPTIONS
1. INITIATE STUDENT SESSION
2. GENERATE STUDENT REPORTS
3. PREPARE A STUDENT DATA DISKETTE
4. CHANGE STUDENT INFORMATION
5. CHANGE DATE AND TIME
6. BACKUP STUDENT DATA DISKETTE
TYPE THE # OF YOUR SELECTION FOLLOWED
BY A (RETURN)■

Figure IV.2 Main Menu.

Upon selecting an option, the teacher/user is prompted through each activity to its completion. Considerable error checking as well as prompting has been built into the program.

Other programs in the IVSET programming software include both data entry and debugging utilities. The data entry utility allows the instructional programmer to build data files based on the instructional parameters they have defined on the IVSET programming sheets. These data are essentially what the system should do and when it should do it. They include question numbers, frame numbers, video and audio flags, coordinate values, parameter

values and branching commands. The data entry utility has a specialized editor to simplify modifications to the data files. A second utility assists the instructional programmer in obtaining coordinate values from the touch panel to determine correct and incorrect responses.

The translater/debugging utility converts data files to a format that utilizes floppy disk space more efficiently as well as checking the data for accuracy. Various videodisc control parameters as defined on the programming sheets are checked in this program to assure both accuracy and completeness. Theses parameters include "GO TO's, frame numbers, coordinate values, audio and video flags, and question numbers.

V. INSTRUCTIONAL PROGRAMS

Time Telling

The Time Telling program (see Appendix B) begins by having students identify each of the numbers on the clockface. The student indicates his/her response by touching the appropriate box below the clockface. The package continues with identifying values for both big and little hand individually and finally together. The student is given a test after each of the 11 objectives and may only continue through the program if he/she meets the 80% mastery level set for the test. Upon completion of the program, the student is able to tell time up to the five minute interval.

Based upon the complexity of the skill being taught, the Time Telling program is relatively long and highly interactive. A student getting every item correct on the first trial will make over 700 responses. Students in the field test at the Woodruff Elementary School in Logan, Utah, spent an average of 4 weeks on the program with daily sessions of approximately 15 minutes each.

The Time Telling program was developed in the project's first year. It utilizes both audio tracks on one side of a 29-minute videodisc. Because of the size of the program and the data file structure used when it was developed, two floppy program control diskettes are necessary to operate the entire program. A video processor is used with the program to allow computer generated numbers to be superimposed on the clockface.

Coin Identification

The Coin Identification program (see Appendix C) requires students to identify coins by touching them on the screen. The student is presented each coin, i.e., a penny, nickel, dime, quarter and half-dollar, and required to identify it in isolation as well as in a group of other coins. The student is given three attempts on each item to make the correct response. On the first incorrect response, feedback is given and the item is repeated. On the second incorrect response, the student is given the correct answer and the item is again repeated. On a third incorrect response, the student is given feedback and branched to a previous instructional sequence. In the Utah State Training School field test, moderately to severly retarded individuals completed the program in approximately 4 weeks. Coin Identification was developed in the first year of the project. It is contained on approximately 10 minutes of videodisc space and uses one program contol diskette.

Word Recognition

The Word Recognition program (see Appendix D) presents the following 8 words to the student: BUS, REST ROOMS, WALK, DON'T WALK, MEN, WOMEN, BOYS and GIRLS. For each word, the students must first identify a picture representing the word(s) from a possibility of four choices. Next, the students are presented the words with 3 distractors and asked to identify the word

by touching the screen. These words are presented using computer generated graphics. Finally the student is presented the word(s) on signs they might see in everyday life with other signs as distractors and is then tested on the word. Moderately to severly mentally retarded students at the Utah State Training School completed the program in an average of 2 weeks with daily sessions of 15 minutes each.

The Word Recognition program was developed in the project's first year. It takes up approximately 20 minutes of space on a videodisc. Due to using computer generated graphics and the structure of the data files when the program was developed, three program control diskettes are used to complete it.

Directional Prepositions

The Directional Prepositions program (see Appendix E) was developed in the second year of the project. The program teaches the following: in, out, on, under, in front of, and behind. The student is first shown a dynamic demonstration of an object being placed in and then out of another object. Then he/she is asked to find the one that is in and then the one that is out. The student is then shown a series of pictures and asked to select which item is in and which is out. On the first incorrect response, feedback is given and the item is repeated. On the second incorrect response, feedback and the correct answer is given. If a third incorrect response occurs, the teacher is signalled for assistance. The student must meet criteria of 80% correct before proceeding to the next set of prepositions.

The program includes considerable teacher prompting and the option to use several different data reporting formats. Feedback on progress is supplied to the student at the end of each session in the form of a thermometer scale generated on the Apple. The program includes a double sided videodisc

and one program control diskette.

Beginning Sight Reading 1 and 2

The Beginning Sight Reading programs (see Appendices F and G) were created as part of the second year's development efforts. Both Reading 1 and 2 use the same videodisc, however, they are programmed quite differently. Beginning Sight Reading 1 contains a maximum of remedial segments (see Figure V.1) while Beginning Sight Reading 2 contains minimum or remediation (see Figure V.2). Both reading programs teach the same words: yes, no, apple, house, red, a, and see. Students are first asked to identify the word when presented with nonsense words as distractors. Next, the words are presented with other real words and finally after all words have been presented, the student is introduced to the words in phrases and is asked to touch the picture that goes with the phrase.

Both programs include extensive teacher prompting and a selection of data report formats. Progress reporting for the student is provided by a thermometer graphic.

Beginning Sight Reading 2 includes a two-sided videodisc and one program control diskette. Beginning Sight Reading 1 includes the same two-sided videodisc and two program control diskttes. The additional program control diskette is necessary because of the amount of remedial segments programmed into the package.

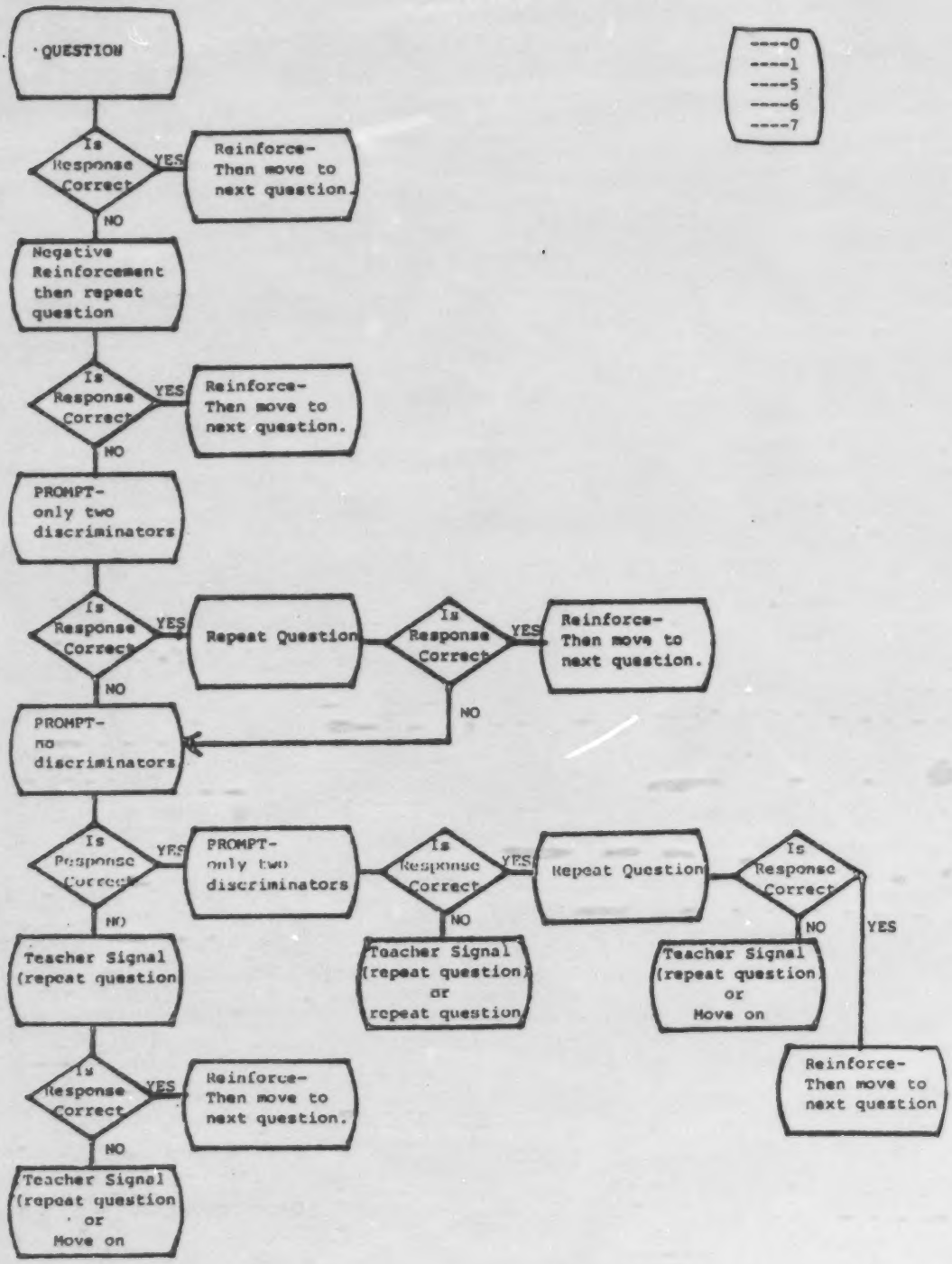

Figure V.1 Beginning Sight Reading 1.

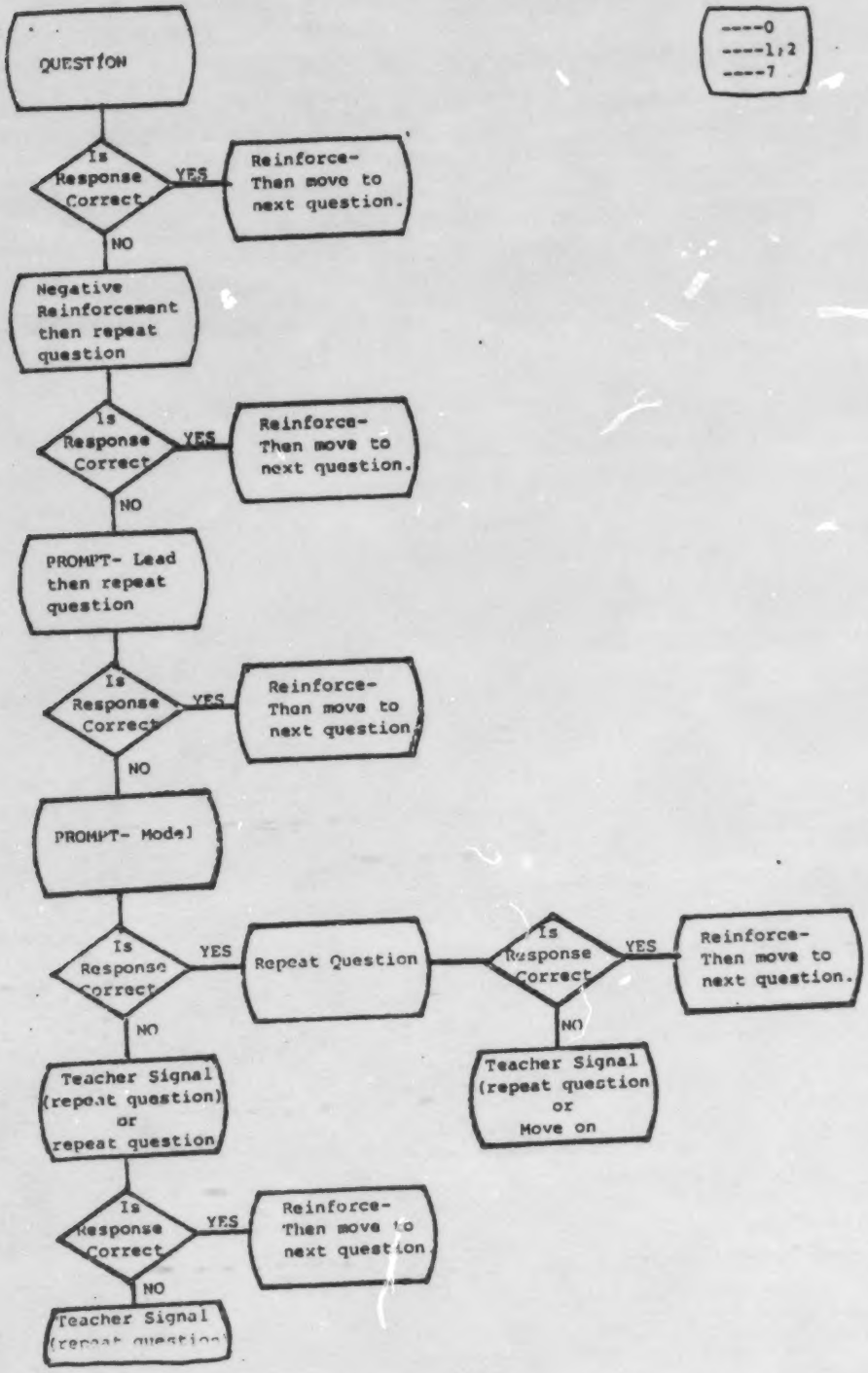

Figure V.2 Beginning Sight Reading 2.

VI. VIDEODISC PRODUCTION PROCESS

Videodisc production begins with the definition of objectives for each instructional area identified. Based on the objectives, instructional sequences are designed in the form of a script. The script addresses both the audio and video aspects of the instructional sequence. Additionally, the script has to specify:

1. the source of the video, i.e., videodisc and/or computer generated graphics;

2. the source of the audio, i.e., which of the two audio tracks should be played;

3. the type of segment, i.e., instruction, remediation, feedback or test; and

4. an identifying number unique to each individual segment.

A scripting sheet was created to address each of these requirements.

Figure IV.1 illustrates a scripting sheet representing an instructional segment from a program designed to teach directional prepositions. When this segment is presented to the student via the IVSET system, the bowl and spoons appear on the television and the student is told "Touch the spoon that's out of the bowl."

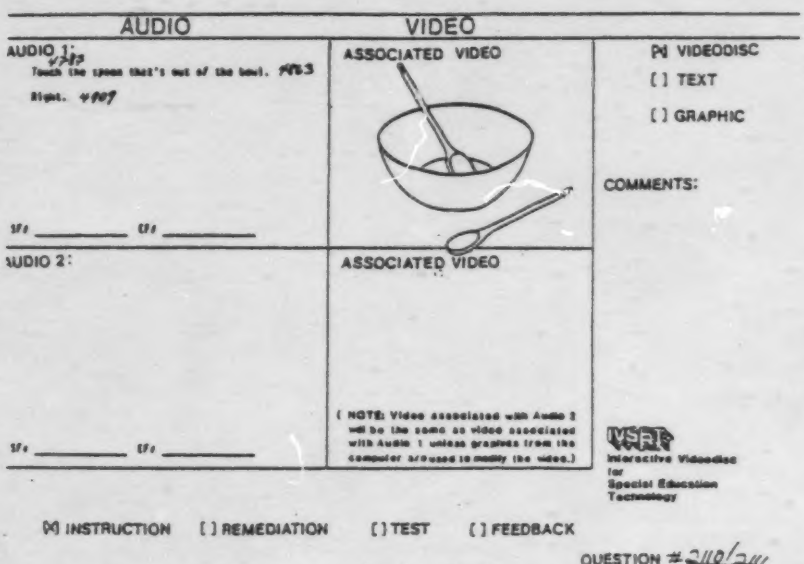

Figure VI.1 Example of Scripting sheet.

Figure VI.2 illustrates a remedial segement for the previous instruction. When this segment is presented, the teacher is shown touching the spoon that's out of the bowl. The audio from Audio Track 1 says "That was a nice try. Watch me. I am touching the spoon that is out of the bowl. Listen again."

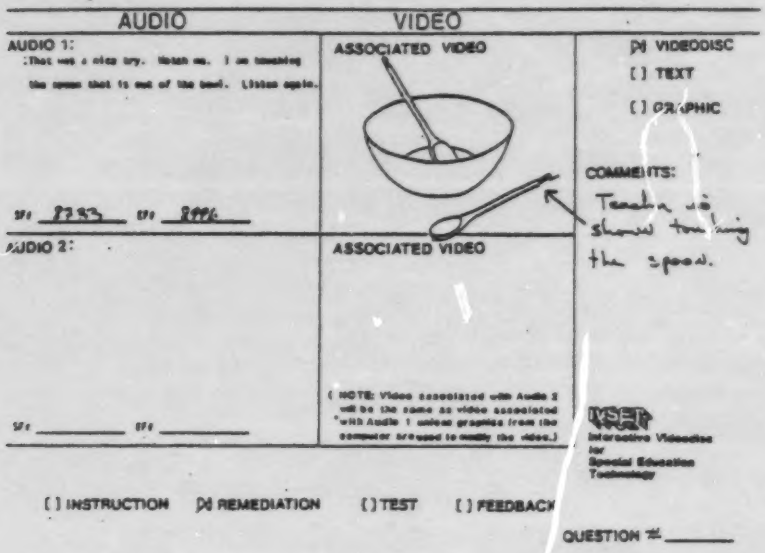

Figure VI.2 Example of Remedial segment

The script serves as a guide from which all of those involved in the video production can work. Each script is reviewed and revisions are made until final approval is given by content consultants. At this point, an assessment of the script is made to determine how the script should be produced to take full ad-advantage of the videodisc capabilities as well as how to condense the amount of videodisc space to be used. Talent is selected and necessary materials produced during this phase. The videodisc script is then evaluated to address the following issues:

1. How much videodisc space will the script use in its present state?

2. How should the script be organized to minimize unnecessary branches, facilitate branching and ease the production process?

3. How can the second audio track be used to enhance the program and/or save valuable audio space on the videodisc?

4. How much video production time is going to be involved in producing the master videotape?

As soon as these questions are addressed and the production script completed, video production services are secured and actual videotape production begins. Video production for all programs is done using the facilities and staff of USU's television production service. High contrast slides, color slides, 16 mm film, 3/4 inch videotape as well as studio generated video are transferred to one inch helical scan Type C videotape. These videotapes are then sent to DiscoVision Associates in Costa Mesa, California for pressing on a videodisc.

VII. VIDEODISC PROGRAMMING PROCESS

In the second year of the project a set of programs for videodisc authoring were completed. The following is a description of the videodisc programming process using that set of authoring programs.

Videodisc programming begins before the videodisc itself is produced. A programming sheet is developed to set up the logic flow for each individual instructional segment.

As soon as the final production script is complete, the instructional developer goes through the script setting up a programming sheet for each individual question or item. A question numbering system has been set up to easily identify the objective and location in the instructional sequence of the item. Except for starting and ending frame numbers and X and Y coordinates, programming sheets can be completed before the videodisc is even produced. This procedure has been found to be especially useful for those just becoming acquainted with interactive video, as it forces the designer to address every possible response and how to handle it before the disc is produced.

When completed, the programming sheets include all the information necessary for the package to run. The beginning and ending frame numbers for each videodisc segment must be located on this sheet as well as a question number identifying each instructional segment. X and Y coordinates as detected by the touch panel are used to indicate where the student touched the television screen. X and Y coordinates representing where the correct or otherwise defined objects are located on the screen allows the computer to evaluate the student's response.

The programming sheet consists of 12 possible subblocks. A subblock is a discrete programming unit which contains all the information necessary to present a linear instruction, test, feedback, or remedial segment and

then go on to the next segment. The sheet in Figure VII.1 has six of the subblocks completed. The function of each subblock is explained below.

1. The first subblock, "I", identifies the Instruction segment.

2. The second subblock, labelled "C", designates the consequence of a correct response. In this case the student is told "Right".

3. The next three subblocks, labelled 1, 2, and 3, refer to consequences following the first, second and third incorrect response. Upon making a first incorrect response, subblock 1 is presented which results in the student being told "That was not right. Watch again." The instruction subblock is then repeated. On a second incorrect response, subblock 2 is presented which results in the student hearing "That was not right. I am touching the spoon that is out of the bowl. Listen again." The original instruction subblock is again repeated. On the third incorrect response, subblock 3 activates a buzzer which signals for help from the teacher. In this particular example, it is assumed that help is required after the third incorrect response because the student was given the correct answer after the second incorrect response.

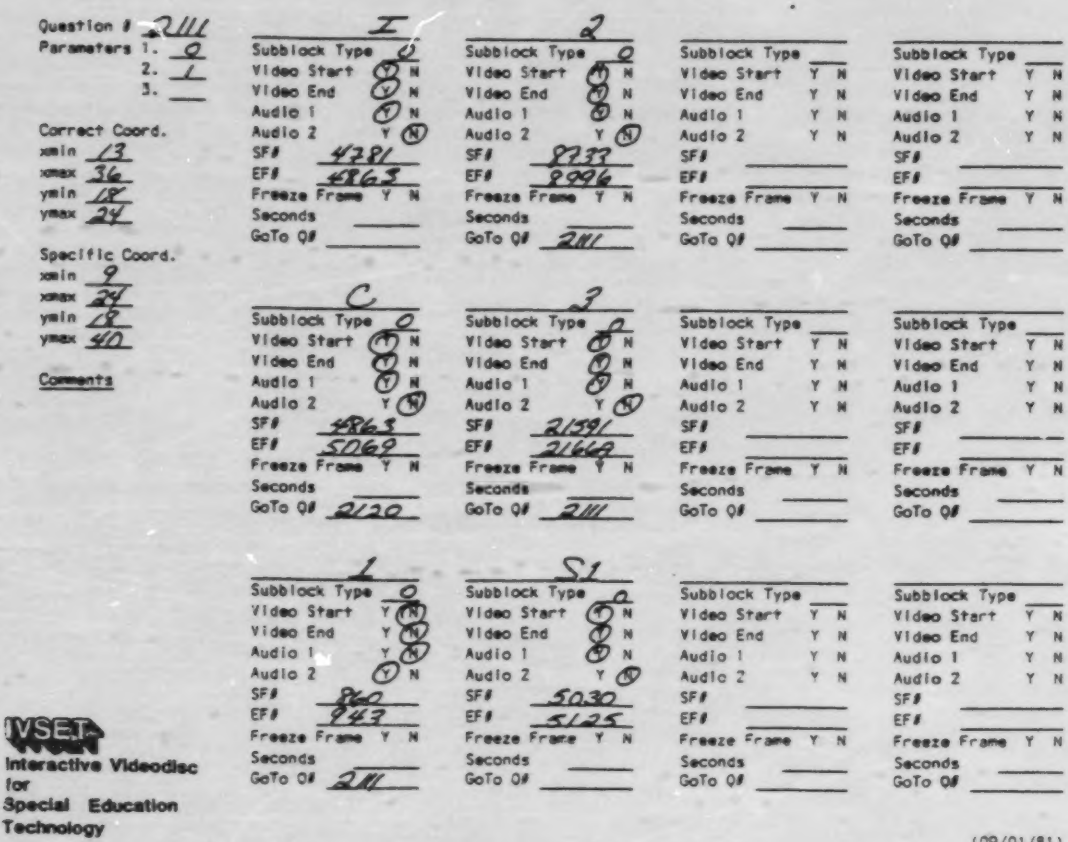

Figure VII.1. Videodisc Programming Form

When the videodisc, check disc or frame number coded 3/4 inch videotape is returned from the videodisc producer, frame numbers and correct coordinates are inserted in the waiting programming sheets. NOTE: At the time these programs were completed, U.S.U. television studios did not have SMPTE time coding capability. Thus, SMPTE time coding was placed on the videotape at the videodisc production facility. Had the original videotape been produced with SMPTE time coding, the frame numbers could have been inserted as soon as the master videotape was completed. Coordinates can be inserted earlier as well. A program that simplifies getting the coordinate values using the videodisc player has been completed.

Entering the Data

When the programming sheets are completed, the information on the forms must be stored on a floppy diskette. This procedure requires the use of the DATA ENTRY program. Using this program, the information can be entered and stored on a floppy diskette by anyone with a working knowledge of the microcomputer keyboard and some experience handling floppy diskettes.

Debugging the Program

After all the data are entered and stored on a floppy diskette, a program is used to check it for syntax or typographical errors. After these corrections are made, the instructional designer must proceed through the program manually checking each branch for errors. For a complete description of the authoring system and the videodisc programming process, see "A System for the Development and Presentation of Interactive Videodisc Instruction" in Appendix I.

VIII. INTERACTIVE VIDEODISC DEVELOPMENT-SUMMARY

Introduction

This section summarizes some of the experiences of IVSET project staff based on two years of experience in producing interactive videodisc programs for use on a videodisc system controlled by an external microcomputer. Also included are descriptions of experiences gained in videodisc production activities upon completion of the IVSET Project.

The relative newness of videodisc technology underscores the importance of sharing experiential information with those just becoming familiar with the technology. Whle the next section cannot be all inclusive and still fall within the scope of this document, it does address some of the questions most often asked by those considering interactive videodisc development.

The Team Approach

Designing an interactive videodisc is a complex instructional product development effort. Combining the requirements of subject area expertise, instructional design, computer technology and video production into a single instructional product results in a strong need for a team approach. The design model the project staff used required varying levels of participation on the part of several professionals throughout the development process. Team members included a subject matter specialist, an instructional developer, a video production person and a computer programmer. In the first year of the project, all team members were equally involved in each development phase. This was necessary initially to develop a process from which future interactive videodisc production could be accomplished. During the second year of the project, levels of involvement were shifted to reflect the full implementation of the authoring system software (See Authoring System Documentation Manual) and the revised development process. Although greatly simplified,

Figure VIII.1 illustrates the design model and the involvement of each team member during the project development phase in the second year of the project.

Videotape Prototypes

Before discussing videotape prototypes, a brief discussion of the videodisc production process will provide the rationale for using prototypes.

The videodisc in its present form is a "read only" medium, i.e., it cannot be recorded on or changed as a videotape can. The process for placing material on videodisc involves producing a high quality (usually 1 inch format) videotape and sending it to a videodisc production facility. In approximately six weeks the videodisc material is returned in the form of a videodisc. The cost for this procedure is approximately $2,000 per 30 minute side and covers the cost of set up and mastering only. Each replication of the master costs approximately $15.

Currently, there are only two videodisc production facilities in the United States. They are:

3M
223-5N 3M Center
St. Paul MN 55144

Pioneer Video (formerly Disco Vision Associates)
3300 Hyland Avenue
Costa Mesa, CA 92626

Many instructional development models emphasize the field test and the revision stage of product development. The cost and permanence of videodisc production dictate a more flexible medium than videodisc for use in the initial development phase. A natural selection is videotape. While videotape cannot match the access time of the still frame picture quality of the videodisc, it provides a flexible format for development and revision.

There are varying degrees of interactivity that can be achieved using videotape as a prototype medium. If the developer is interested in simply viewing the prototype product for evaluation by a review team, any format

PROGRAM DESIGN

---Objectives

---Script

---Story board

---Flow charts

At this initial development phase, all team members are involved. The subject matter expert and instructional developer work together to define objectives and draft a script. The script is reviewed by the video producer for feedback on production considerations. It is also reviewed by the computer programmer for feedback on both the capabilities and constraints of the authoring system. At this phase, the programmer can begin modifying the authoring system, if necessary, to account for demands of the instructional program. All team members review scripts until a final copy is accepted.

VIDEODISC PRODUCTION

---Tape, film or otherwise obtain source material

---Review and revise

---Premaster to 1" videotape

---Conversion to videodisc

During videodisc production, the video producer works closely with the subject matter expert and the instructional developer to assure the final product will be both instructional and aesthetically sound. All team members review and add input on revising the material before it is premastered and sent to the videodisc production facility.

VIDEODISC PROGRAMMING

---Use authoring system to enter all data necessary to make disc interactive

---Debug program

Using the authoring system, the instructional developer programs the videodisc based on the flow charts from the design phase. The completed software must then be carefully checked for errors.

Figure VIII.1 Product Development Phases - Second Year

videotape will work well using the basic functions of the videotape player. When a prototype videotape includes multiple instructional segments which must be reviewed individually, a programmable remote access search unit for the videotape machine is desirable. Based on a time system, the unit used by IVSET staff allows for searches to various locations on the videotape. Instructional segments can be identified by the times at which they occur on the videotape. For example the segment "Touch the ball that's on the table" may be located at 15:06 on the videotape. Up to 63 segments can be stored in the memory of the unit and up to eight of the instructional segments can then be presented in any order desired. This allows staff to conveniently and quickly look at the continuity between the various videodisc segments.

While this method of prototype testing is valuable in evaluating the aesthetics and production quality of the videotape, it is not suitable for use with subjects in a field testing situation. Although the development of a system suitable in a field testing situation has occured outside the scope and time lines of this project, it is described as a point of interest for those involved in videodisc production. An interactive videotape system to use in field testing situations with students has several requirements: (1) it needs to be sufficiently interactive to simulate portions of the instruction that will eventually be on the videodisc; (2) it needs to be able to collect and maintain data; and (3) it should be capable of utilizing the authoring and presentation software already developed.

There are several interactive videotape systems commercially available. Most of these systems include an interface board which sits inside the microcomputer and cables to hook up the videotape recorder and interface board. A major difference among these commercially available interfaces is the software programs which operate them. Only one interface offered a choice of software in either the BASIC or Pascal computer language. After considerable investi-

gation, a decision was made to produce a videotape interface which would closely match the specifications of the videodisc interface we are currently using. The rationale behind this decision is two-fold. First, nothing commercially available at this time seems to meet our needs. Secondly, to be able to move from a videotape prototype to a final videodisc product without restructuring the computer software would be practical and efficient. In addition, the time required to modify our existing software for one of the commercially available interfaces would be eliminated. This interface board is currently in a wire wrapped prototype stage and should be commercially available in late 1982.

Videodisc Storage Capacity

A misconception still remaining among many who have not yet been directly involved in videodisc development involves the storage capacity of the videodisc. When videodisc first hit the market, a popular descriptor of the 54,000 frame capability was that the entire contents of the Encyclopedia Britannica could be contained on a single disc. This was a useful means for conceptualizing the massive single frame storage capacity of the disc. However, confusion was created when this storage potential was generalized to disc material requiring audio and/or motion.

Each videodisc is comprised of 54,000 separate video pictures or frames with each picture having its own unique address or location. This storage capability makes the videodisc an incredibly powerful storage medium for archival uses when frames are used on an individual basis. The storage potential of the disc diminishes greatly when we realize that to utilize the audio and/or motion capabilities of the videodisc, it must be in the play mode. This results in 30 of these 54,000 frames being played each second. Consequently, when audio and/or motion are required in a videodisc production, the maximum storage capacity of each side of the videodisc is 30 minutes.

The purpose of the IVSET project instructional material was to present computer assisted instruction to non-readers. Verbal instructions were given to the student through the audio tracks on the videodisc. This resulted in a less cost efficient use of the disc in terms of actual space on the disc. Several steps were taken to attempt to minimize this use of space.

Editing between instructional segments was kept to within 3 frames from the end of the audio from the first segment to the next. In addition, the second audio track was used whenever possible to save space.

When using the second audio track a couple of factors needed to be kept in mind. First and foremost, the audio and video cannot be disassociated, i.e., everytime you play a given audio segment it will play the associated video. Consequently, if the same phrase is to be used over and over again with different video pictures, it must be placed on the disc again everytime the video image changes. For example, "Touch the number for the little hand" in the time telling program was placed on the disc each time the little hand pointed to a different place on the clock face.

The implication of this feature is that the second audio track can only be used to vary the audio that is associated with a given video image. For example, in the time telling program, the student is shown a clock face with a big hand and a little hand. The audio on the first audio track says, "Touch the number for the little hand." The audio on the second audio track says, "Touch the number for the big hand." The computer presents these segments in order by searching back to the beginning frame number of the segment and switching to audio track two after the student makes a correct response for the first instruction.

While this type of procedure saves videodisc space, it takes more time to engineer in the production studio. When videodiscs for this project were

produced, editing was audio dependent, i.e., when the audio was completed for the instructional segment the edit was made for the next instructional segment. Thus, the length of the video is dictated by the length of the audio. Care must be taken to assure that if the instruction on the audio tracks vary in length, that the edit is made after the longest audio segment. This prevents the video picture from changing before the instruction is completed.

Premastering

Original material to be mastered into a videodisc may be in the form of slides, film, videotape or computer graphics. Before a videodisc can be mastered, however, all source material must be transferred to a videotape format. The format preferred by both videodisc production facilities is 1 inch Type C videotape. This transfer process is called premastering.

Source materials for premastering may include the following mediums:

* 1-inch type C videotape
* 2-inch quad videotape
* 2-inch helical videotape
* 1-inch type B videotape
* 35 mm slide film
* 35 mm motion picture film
* 16 mm motion picture film

Other formats which are discouraged for use as source material include:

* 3/4 inch UMATIC cassette
* Super 8 mm film
* All 1/2 inch videotape formats

Videodiscs produced for this project were all premastered at the television production facility at Utah State University. Source material included slides, 3/4 inch UMATIC videotape, 2 inch quad videotape, and 1 inch Type C

videotape. Quality of the final videotape varied, based more on the quality of the original source material than on the format used. We found first or second generation 3/4 inch UMATIC videotape produced a stable, good quality image when transferred to videodisc.

Each videodisc production facility now has published specifications for premastering. They can be obtained by contacting either production facility. These specifications include maximum luminescence of the video signal, audio levels, tape leader, color bars, tone, and SMPTE time coding.

SMPTE Time Coding

SMPTE time coding is a standard time coding system established by the Society of Motion Picture and Television Engineers. SMPTE is a frame accurate time coding system which essentially makes the frames on the premastered videotape the same as the frame numbers on the finished videodisc.

At the time the videodiscs were produced for the project, USU television facilities did not have SMPTE time coding capability. SMPTE time coding was placed on the tape at the videodisc mastering facility. This meant the exact frame numbers for the videodisc were not known until it was completed. Given the model we followed for videodisc programming this did not create any major difficulties; however, when the developers must know exact frame numbers before the videodisc is completed, e.g., when digital dumps are to be placed on the disc, SMPTE time coding capability becomes more critical.

Videodisc Quality

A general rule of thumb to follow in producing a videodisc is that any flaw in the premastered videotape will be greatly magnified in the final videodisc. The videodisc potentially can produce an excellent video image, but care must be given to produce a high quality premaster videotape. The same technical production techniques used when producing any high quality videotape

should be followed. Pioneer Video offers, for a charge, what is called a check disc. This disc is made available for the customer who is producing a disc with digital dumps. Using the check disc, the customer can check the branching logic of the digital dumps on the videodisc before the desired number of copies are replicated. The check disc is not meant to serve as a quality control check on the original premastered videotape. Be certain the premastered videotape is the way you want it before beginning the mastering process.

Because of the relative infancy of the videodisc mastering process, the general physical quality of videodiscs varies significantly across production facilities and time. The videodisc mastered during the first year of the project were of high physical quality and were completed in approximately 8 weeks. This work was done by DiscoVision Associates, now Pioneer Video. The videodisc produced in the second year of the project were severly warped upon delivery and had difficulty accessing a number of frames. Upon review of the problems, Pioneer Video agreed to remaster and replicate the disc. The time frame involved in the process, however, extended into several months, causing overall delays in the project's timelines.

IX. FIELD TEST RESULTS

Introduction

During the course of the project, five field tests were conducted. The major goal of all field tests was to obtain information useful to the continued development and refinement of the system. Comparison groups were used, but not for the purpose of comparing the effectiveness of the MCVD instruction with paper and pencil instruction. Rather, our interests were in comparing the process differences involved in delivering similar programs through the two different delivery systems. These comparative data were used to identify problems within the MCVD program.

Encompassing all five field tests were the following major research questions: (1) How effective are the instructional programs and how effective is the system with different levels of mentally retarded students? (2) How effective is the system for providing feedback useful for instructional improvement? (3) What procedures are required for implementing the MCVD system in the classroom? (4) How cost effective will this system or a similar system potentially be in a classroom situation? Each separate field test was also guided by research questions specific to the population and the instructional package involved. Each field test is discussed separately in the following sections.

Matching Program Field Tests. The first program to be field tested during the project was the Matching Shapes, Sizes and Colors Program. This instructional program was adapted from a paper and pencil program developed by Hofmeister (1976). The actual development of the MCVD version of the program was accomplished in a pilot project prior to the official beginning of the IVSET project. Field testing and consequent revisions were under the auspices of the IVSET project. The program was field tested at two sites.

Exceptional Child Center Field Test-Matching. When the project was first proposed, the target population was anticipated to be moderately mentally handicapped children and adults. Specific entrance criteria were not defined at that time and a more specific definition of the target population was required. The selection criteria for this preliminary field test was that the child had sufficient motor capacity to hold a pointer and point at the screen and that the child had sufficient receptive language to understand simple commands such as "Touch the screen," "That was not right," "That was right," etc. Six children were selected from the Exceptional Child Center, using the criteria and the field test was conducted. The subjects chosen to participate in this field test ranged in age from 4 years, 5 months to 13 years, 2 months. The mean age was 8 years, 11 months. The Mental Age (MA) ranged from 4 years, 1 month to 8 years, 11 months. The mean MA was 4 years, 1 months, as measured by the Slosson Intelligence Test. The six subjects (two girls and four boys) were selected on the basis of never having used the matching program in its manual form, and of having only a few or no matching skills. Children who had some matching skills were included because, due to their attention span and behavior, they were not able to attend the regular classroom programming for any great length of time.

Each subject received one to two days of pre-programming instruction before beginning the program. Additionally, two subjects were re-instructed due to revisions in pre-program instruction and criteria. The subjects were required to achieve three out of four consecutive trials in a touch sequence before they started the program. They were also instructed on how to wait to touch the screen until they heard a beep, letting them know it was their turn.

The average length of time of each session was fifteen minutes, with about ten minutes being spent in actual instruction by the program. Three levels of difficulty of matching across sizes, shapes and colors were presented. The easiest level was the task of identifying the one member of a group that matched the sample. The next level called for picking out the two members of a group that matched the sample, and the third level required the selection of the three members of a group that matched the sample.

Two instructional strategies were considered; in strategy one, one area, e.g., color matching would be taught at all three levels of difficulty before moving on to the next area e.g., shape matching. Hopefully the student would start at the second level, advance to the third level and then move to size matching, starting at the second or third level. In strategy two, the first level of difficulty in color would be taught, then the first level in shape, and then the first level in size. The next steps would be to teach the second level in color, shape and size, and then the third levels in color, shape and size.

In keeping with the principle of lean programming[1] the shorter approach, the first strategy, was chosen. The data in Figure IX.1 represent the pattern of pupil responses for the remaining five subjects.

The trials per lesson refers to the average number of times required to complete a lesson. Three consecutive correct trials were necessary before the pupil could move to the next lesson.

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[1]Lean programming refers to the practice of field-testing with the least expensive approach. Field-test data will identify when an instructional sequence is incomplete. It is, however, very difficult to determine when a sequence contains superfluous material. To avoid developing materials that are unnecessarily expensive in terms of learner time, the least expensive approach is taken first, and the field-test data will indicate whether more materials or time is needed.

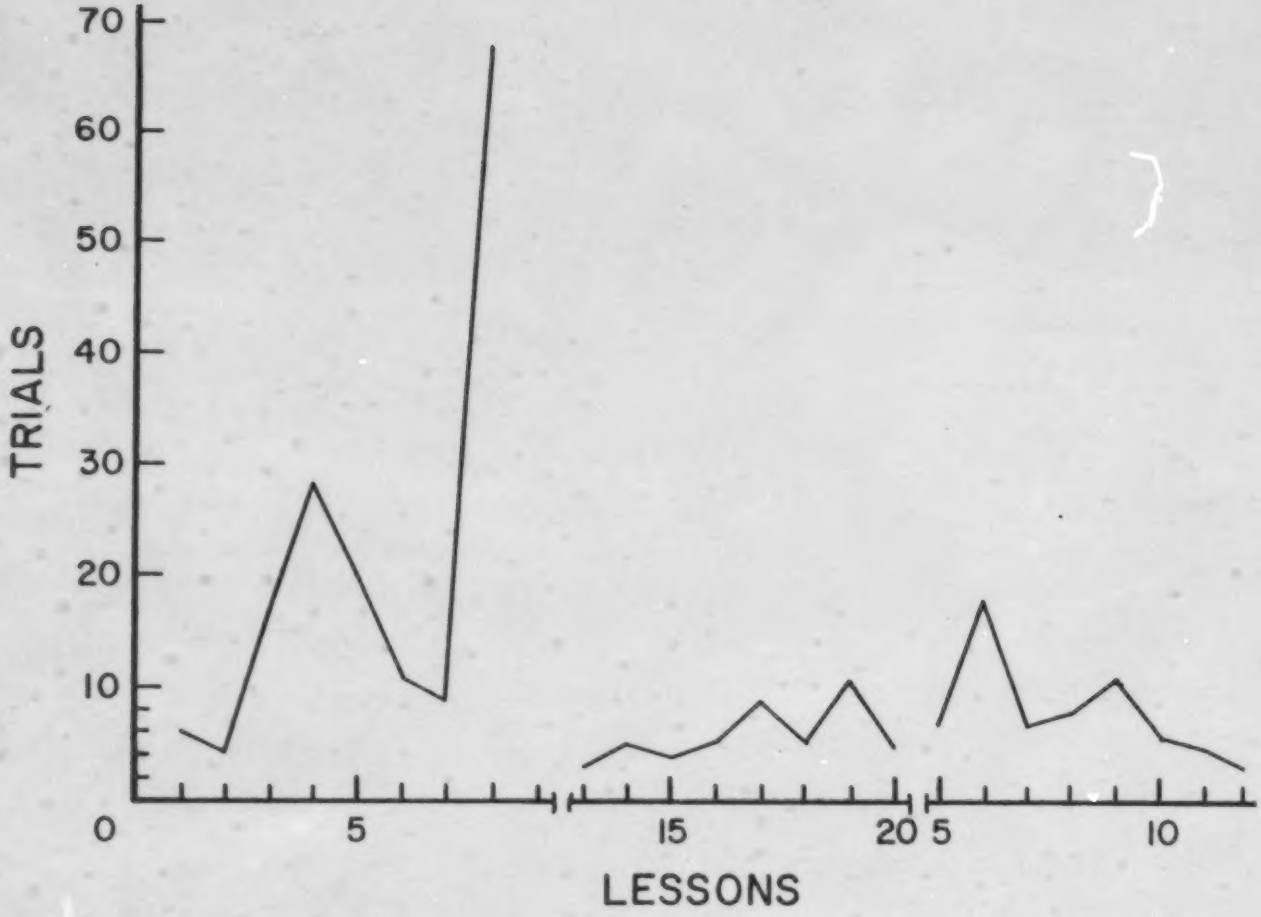

Figure IX.1 Average number of trials for each lesson. The program was stopped after lesson 9 and resequenced. The students started over with lesson 5 after they had completed lesson 20.

Figure IX.1 illustrates the average number of trials for each level of the color matching lessons.

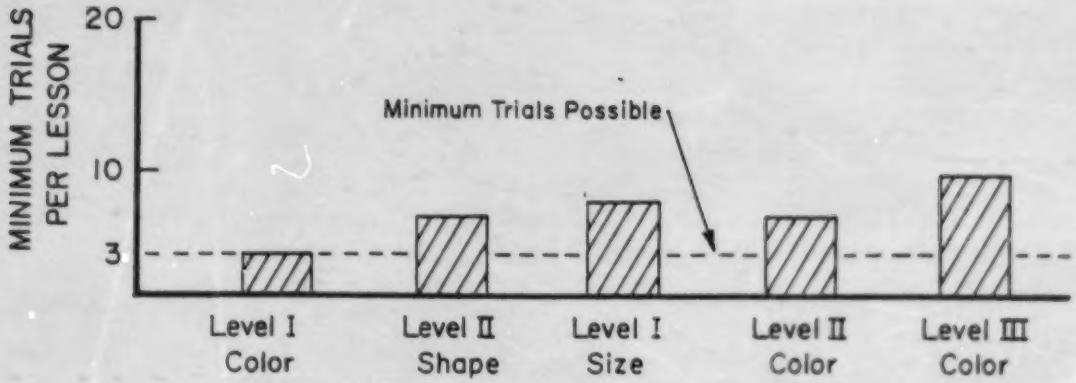

Figure IX.2. Trials per color matching lessons for instructional sequence 1.

Instruction in the first sequence was terminated when the two leading pupils had reached a point of frustration.

With the aid of the Instructional Authoring System, the lessons were re-ordered into the sequence illustrated on the horizontal axis in Figure IX.2. This sequence was an adaption of the second strategy (see above discussion). The number of trials per session were reduced. Such a reduction was to be expected for Level I color lessons because these lessons had been completed successfully by all pupils during the first sequence. However, no pupils had previously completed Level III lessons, nor had the pupils been exposed to Level I lessons for shape and size. One of the two leading pupils had stopped in the first sequence at Lesson 8 after 125 trials. In the second sequence, this pupil passed Lesson 8 after 14 trials. The other leading pupil had stopped in the first sequence at Lesson 9 after 74 trials. In the second sequence, this pupil successfully completed Lesson 9 after 11 trials.

In addition to resequencing the lessons, the reinforcers were revised several times throughout the field test as a result of observing the responses of the subjects. Some of the responses included mimicing the puppet, word

for word on the reinforcement segments, whether they were positive or negative. It was also observed that those reinforcement segments containing music were very appealing to all the subjects. The following changes were made are various times during the field test:

1. Color graphics were added to fill in the blank screen in between positive reinforcement segments.

2. Melodic tones were added to the color graphics.

3. A single tone was added so that when the subject made an error he/she would hear an unappealing sound.

4. A more enthusiastic positive reinforcement segment by the puppet was added, replacing the one previously used.

5. A less enthusiastic negative reinforcement segment replaced a more animated segment, which the subjects actually seemed to be enjoying.

6. One particular segment was always shown at the completion of each lesson. This segment showed a lot of movement and had background music. This change was done because the subjects enjoyed the reinforcement segments a great deal more if they included music.

7. The subjects could only view the above mentioned reinforcement segment at the completion of each lesson. If the subject failed the lesson and was sent back to complete a lesson previously passed, then he/she would not get the standard reinforcement segment.

Brigham City Adult Day Care Center Field Test-Matching. A second field test of the Matching Program was conducted at an adult day care center in Brigham City, Utah. The major reason for this field test was to test the revisions introduced by the first field test and to obtain information on the appropriateness of the reinforcement sequences with an adult population.

Information collected by observation included feedback on the appropriateness of reinforcers, attention spans of individuals, and specific positive and negative aspects of the program and system.

1. Positive feedback responded to were sections in which the puppet says. "Gee, you're smart," "Very good touching," etc. and the short segment utilizing

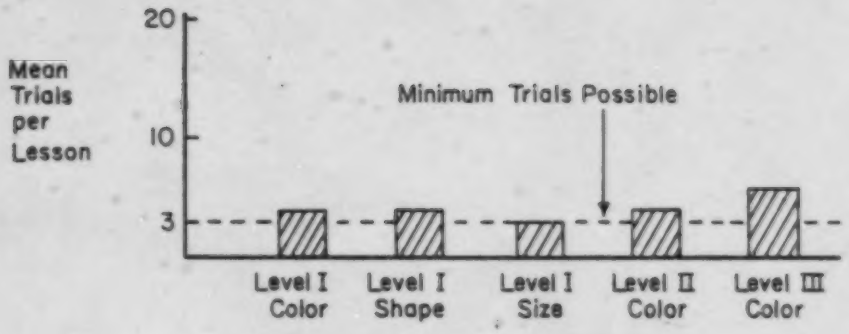

Figure IX.3. Trials per lesson for instructional sequence 2, Group 2.

a Sesame Street-like puppet. The most popular, however, was the 30 second film clip of men on a playground. This particular segment utilizes two approaches not found elsewhere in the positive feedback. Music is played on the audio track and exaggerated motion typifies movement of the adults on the video.

Among positive reinforcement segments not responded to were those including children playing, singing, etc. Cartoon-like reinforcements, such as frogs clapping, generally received more response than real-life situations (people clapping).

A pretest and post test were built into the program and the average percentage correct for the pretest was 53% and the average for the post test was 100%. Additionally, a paper and pencil test administered resulted in an average percentage correct on the pretest of 90% and an average of 100% on the post test.

A great deal of information was gained during these two field tests on system reliability, instructional sequencing and appropriateness of the system to the populations we were dealing with. This information was used extensively in designing subsequent programs.

State Training School Field Test. A field test of the MCVD system and three instructional programs was conducted at the Utah State Training School in American Fork, Utah, between October 1, 1981 and February 15, 1981. Three instructional programs were used: (1) Time Telling, (2) Identification of Coins, and (3) Functional Words. The four objectives of this field test were to (1) test the reliability of the hardware and computer programs; (2) collect data for the analysis of the instructional sequencing; (3) investigate the instructional effectiveness of the three instructional programs; and (4) determine the appropriateness of using the system with severely mentally handicapped students.

The hardware, computer programs, and instructional programs were considered to be in prototypical form. Even though comparison groups were used, it was not considered a summative evaluation. The field test evaluation was formative in that the intent was to collect data to assist in the continued development activities of the project.

A major question regarding the MCVD system and instructional programs is their applicability to various handicapped populations. It was determined that the most efficient procedure would be to begin with the more severely handicapped and then move to levels of less severity. There is a fair amount of evidence to suggest that students with low ability require smaller increments between instruction steps.

The system is designed to allow the student to progress through the instruction at his/her own rate. Therefore, if a less severely handicapped student does not require the extensive remediation built into the instructional sequences, the sequences will be skipped.

The population at the Training School was ideal for this field test for several reasons. First, there is a large accessible population of approximately 180 residents. Second, the Training School has students with

a diverse range of handicapping conditions including moderately, severely and multiply handicapped persons. Third, the Training School staff were very interested in the potential for individualized instructional systems especially in the area of living skills.

The system and the three instructional programs were demonstrated to the teachers and psychologists at the Training School. Based on this demonstration, they determined which students would be appropriate for each of the three programs. This determination was based on the staff's perception of each student's ability level and their past experience with the three areas of instruction. From this initial determination and with consultation from the staff, the minimum Mental Age (MA) criterion of 6 was established for the Time Telling program, minimum MA of 5 for the Functional Words program, and MA of 4 for the Coins program. See Table IX.1. This provided a measure for initial screening. Final screening was accomplished through pretesting.

Table IX.1 Means and standard deviations for the students in each group for IQ, Mental Age (MA), and Chronological Age (CA). MA and CA in months.

Program	Group		IQ	MA	CA
IDENT of COINS	MCVD	Means	27.67	52.00	25.17
		SD	5.88	5.91	7.56
	P&P	Means	29.75	29.75	23.17
		SD	6.14	5.96	9.33
TIME TELLING	MCVD	Means	42.91	76.54	24.18
		SD	11.69	16.34	5.42
	P&P	Means	42.47	78.12	25.71
		SD	7.98	11.11	6.14
FUNCTIONAL WORDS	MCVD	Means	33.00	64.67	29.91
		SD	9.00	15.61	10.39

The selected subjects were randomly assigned to two groups within the Time Telling and Coins program. One group was to receive instruction from the MCVD System, and the comparison group was to receive one-to-one instruction from an aide using a paper-and-pencil version of the Time Telling and Coins programs. A comparison group was not established for the Functional Words Program because a paper-and-pencil version was not available.

An attempt was made to minimize teacher intervention with the MCVD groups in order to determine the effectiveness of the MCVD Program, independent of this factor. The IVSET staff members conducting the field test were instructed to intervene when there was an equipment problem, a behavior problem or when it was evident that a student would not be able to pass a particular objective. A criterion of ten sessions on the same objective was established as the point to provide intervention.

1. System Reliability. The reliability of the software was good. No major bugs were discovered in the computer programs, however, hardware reliability was a problem.

Two systems were in operation at the field test site, and during the first two week period, there were an average of 6 equipment breakdowns per day. Almost all of these breakdowns were caused by malfunctions in those parts of the system that were prototypical: (a) the interface board, (b) the touch panel, and (c) an experimental board that allowed video from both the videodisc and the computer to be displayed on the screen at the same time. This board caused an overheating problem which was relieved by the addition of a small fan. By the end of the field test, the reliability had improved considerably and breakdowns had been reduced to 2 per day.

It should be noted that the Apple, videodisc player, and monitor were not a source of hardware problems, which is important because improvement of these devices is not easily accomplished.

2. Instructional Improvement. The progress of each student was continually monitored. In addition to data collection with the MCVD system, observation forms were used to record software and hardware problems, student behavior problems, frequency and type of teacher intervention, and general comments.

Data collected by the system were summarized and analyzed daily. When a problem was detected, the source of the problem was pursued through the use of both the machine-collected data and the observational data. In most cases the problem could be isolated to a particular segment of instruction.

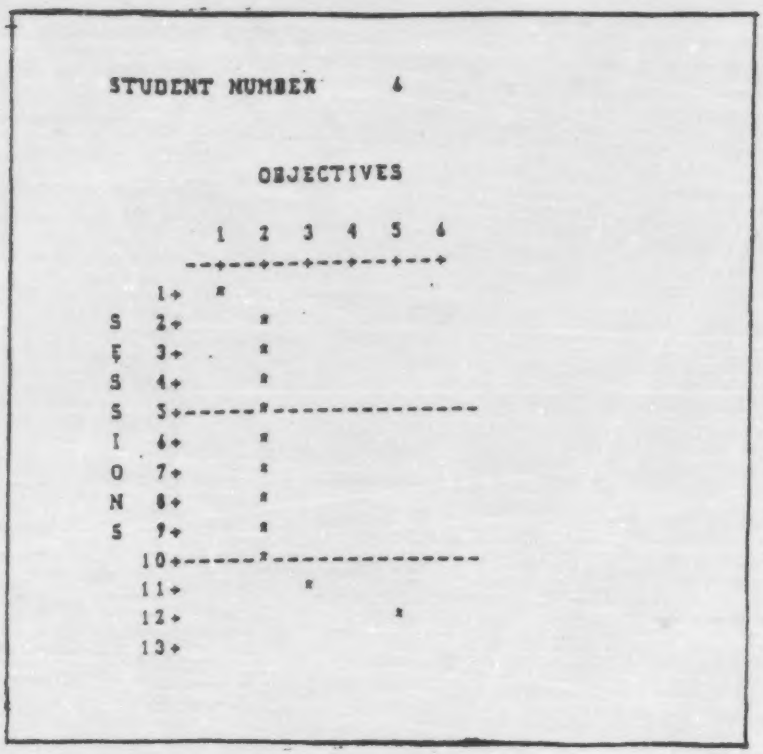

Figure IX.4. Each asterisk indicates an objective the student is working on during a particular session.

In one case the students were having a difficult time attaining objective #2 of the Time Telling Program (See Figure IX.4). Examination of the data

revealed that all the students were having difficulty on the same segment, and that these segments occured every other time in a particular part of the sequence. It was discovered that the instruction was requiring the student to remember the choice made on the previous response, which was not meant to be part of the instruction.

The problem was sufficiently severe to warrant modifying the system, and was solved by installing a video overlay board. This board allowed a video prompt to be placed on the screen to remind the student of his/her previous choice. Thereafter the response pattern changed, and the students were able to progress through the objective.

Table IX.2. Each entry indicates a student's response. Answer key: Ø=correct, 1=incorrect, and 2=non-response. Latency is the number of seconds between the time an instruction is presented and the student's response.

ITEM ANALYSIS DATA

Crunched Student Response File

Student Number	Session	Question Number	Answer	Latency	TEACHER SIGNALS
1	7	390	0	133	
1	7	400	1	61	
1	7	400	0	13	
1	7	410	0	9	
1	7	420	0	19	
1	7	430	1	139	
1	7	430	0	15	
1	7	440	0	140	
1	7	450	0	41	
1	7	452	0	236	
1	7	453	0	93	
1	7	454	0	29	
1	7	455	0	6	
1	7	456	0	9	
1	7	457	0	13	
1	7	458	2	249	
1	7	459	1	14	
1	7	460	1	250	
1	7	142	1	65	
1	7	140	2	250	
1	7	140	2	251	
1	7	140	0	155	
1	7	150	2	251	
1	7	152	1	133	
1	7	152	2	249	
1	7	140	0	229	
1	8	140	0	0	
1	8	150	0	124	
1	8	160	0	209	
1	8	170	0	113	
1	8	180	0	11	
1	8	190	0	117	
1	8	200	0	14	
1	8	210	0	28	
1	8	220	0	57	
1	8	230	0	38	
1	8	240	0	48	
1	8	250	0	33	
1	8	260	0	111	
1	8	270	0	14	
1	8	290	1	228	
1	8	290	0	129	
1	8	300	0	34	
1	8	310	1	130	
1	8	310	0	17	
1	9	310	0	8	
1	9	320	0	8	

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Examination of the response data in another instance identified a major sequencing problem in the Coins Program. Refer to Table IX.2 and note where the question number changes from 459 to 160. Also note that the next nine responses for this student have relatively long latency times. Latency is the time between presentation of the instruction and a response.

Approximately 25 seconds is considered a non-response. The student is reminded by the system to respond, and the same instruction is repeated. When a question number is lower than the previous number (459 preceeds 160), it indicates that the student has been cycled back to previously encountered instruction.

3. Instructional Effectiveness. As was mentioned earlier, the MCVD system was in a developmental state, and these field test evaluations were considered formative. The paper-and-pencil (P & P) comparison groups were established to provide comparative effectiveness data that could be used to identify problems in the MCVD instruction. Even though it was a comparative design, it was not used to determine which method of instruction was most effective. It is important to reiterate and emphasize this point so that the reader does not misinterpret the reasons for establishing the field test design. For the purpose of this field test, the MCVD system must be considered an immature system. The P & P instructional program was well established and had been extensively field tested. And, as was stated earlier, the paper-and-pencil instruction was delivered by a trained aide on a one-to-one basis. This combination resulted in an ideal system in that a mature instructional program was delivered with a high intensity of student/teacher interaction. It was felt that this ideal comparison group would give us the most valuable information with regard to program improvement, and would guide us in the development of future MCVD instructional programs.

Because of the equipment problems in the MCVD groups, the P & P groups had more actual instruction time over the duration of the field test. However, it was evident that the groups progressed at a higher rate than the MCVD groups even when this down time was considered. All groups progressed during the 11 week period, and all groups except the MCVD Time Telling group made statistically significant gains between the pretest and post test. The pre and post tests were paper-and-pencil tests and were the same for all groups within each program. Table IX.3 lists the means, standard deviations and t values between the pre and post tests for each group.

Table IX.3. Means, standard deviations and t values between pretest and posttest score for each group.

PROGRAM	GROUP		Pre Test	Post Test	t-VAL Prob
IDENT. of COINS	MCVD	Means	6.25	8.75	t=3.0
		SD	2.53	3.17	p<.01
	P&P	Means	4.42	10.17	t=6.1
		SD	2.61	2.89	p<.05
TIME TELLING	MCVD	Means	8.66	10.33	t=1.0
		SD	2.87	4.47	p>.05
	P&P	Means	11.05	15.18	t=2.9
		SD	3.02	4.48	p<.05
FUNCTL WORDS	MCVD	Means	17.75	22.00	t=2.7
		SD	3.54	3.25	p<.05

Extensive data analysis was conducted in order to glean maximum information from the field test.

It was obvious from these analyses that the P & P group progressed faster than the MCVD groups in all three programs. Table IX.4 shows the average number

of objectives completed for each program.

Table IX.4. Average number of objectives completed for each group and program and total number of objectives possible for each program.

Program	Group	Average Number of Objectives Completed	Number of Objectives in Program
Time Telling	P&P	8.88	11
	MCVD	2.09	11
Coins	P&P	4.67	5
	MCVD	3.75	5
Functional Words	MCVD	21.18	24

Considering this difference in rate, an interesting question is how the MCVD subjects would have done on the post test if the field test could have been continued, and the subjects had been allowed to complete all objectives. It is reasonable to project that they would have completed them, given enough time since the objectives in all three programs had similar levels of difficulty. None of the programs had objectives that became progressively more difficult to attain. Based on this assumption, analysis was conducted in an attempt to determine how the groups compared if the number of objectives completed were held constant. An investigation of the correlations for the Coins and Time Telling Programs provides additional impetus to pursue this line of analysis. Note in Tables IX.5 and IX.6 that the correlation between post test and number of objectives completed is relatively high, i.e., .72

for the Coins Program and .67 for the Time Telling Program.

Table IX.5. Correlation Matrix for Identifiction of Coins Program.

Variables N=24	1 Pre Test	2 Post Test	3 IQ	4 MA	5 CA	6 Obj
1. Pretest	1.00	.29	-.11	.37	.28	.27
2. Post test		1.00	.16	.19	-.004	.72*
3. IQ			1.00	.43*	-.31	.46*
4. Mental Age (MA)				1.00	.32	.31
5. Chron. Age (CA)					1.00	-.08
6. # Objectives						1.00

* Significant at .05

Table IX.6. Correlation Matrix for Time Telling Program.

Variables	1 Pre	2 Post	3 IQ	4 MA	5 CA	6 Obj
1. Pretest	1.00	.35	.41*	.51*	.27	.31
2. Post test		1.00	.33	.25	-.05	.67*
3. IQ			1.00	.93*	-.32	.15
4. Mental Age (MA)				1.00	-.19	.16
5. Chron. Age (CA)					1.00	-.13
6. # Objectives						1.00

Significant at .05

Based on the assumption of equally spaced objectives and equal level of difficulty for each objective and the high correlations between post tests and number of objectives completed, analysis of covariance (ANCOVA) seems appropriate. Tables IX.7 and IX.8 contain the results of the ANCOVA's.

Table IX.7. Identification of Coins Program Analysis of Covariance on Posttest with Pretest and number of objects completed as covariates.

Source	df	SS	MS	F	P
Groups	1	3.35	3.35	.68	P>.05
Covariates	2	112.13	56.03	11.39	P<.01
Error	20	98.48	4.92		
Total	23	213.96	9.30		

Group	Pretest Means	Number Objective Means	Unadjusted Post test Means	Adjusted Post test Means
1. Paper and Pencil	4.42	4.67	10.17	9.89
2. MCVD	6.25	3.75	8.75	9.03

Table IX.8. Time Telling Program Analysis of Covariance on Post test with pretest and number of objectives completed as covariates.

Source	df	SS	MS	F	P
Groups	1	19.42	19.42	1.73	P>.05
Covariates	2	210.14	105.07	9.35	P<.01
Error	18	202.26	11.24		
Total	21	431.82			

Group	Pretest Means	Number Objective Means	Unadjusted Post test Means	Adjusted Post test Means
1. Paper and Pencil	10.72	8.88	15.08	11.21
2. MCVD	8.55	2.09	10.21	15.81

As can be seen from both Table IX.7 and IX.8, the differences between the means adjusted by the ANCOVA was not significantly different at the .05 level. In can be inferred that the MCVD groups would have achieved approximately as well as the P&P grups if they had been allowed to complete all objectives of the three programs.

A control group for the Functional Words Program was not established, mainly because a paper and pencil version was not available. Twelve students began the Functional Words Program. One student was dropped because of vision problems, and nine of the students completed the entire program which consisted of 24 objectives. The nine that completed all 24 objectives accomplished this in an average of 13.8 sessions, with the range being 11 and 18 sessions. Two of the students completed 28 and 31 sessions respectively without completing the program. They completed 6 and 11 objectives respectively. With these two students included, the average number of objective attained was 21.18, as indicated in Table IX.4. Table IX.3 lists mean pre and posttest scores for the Functional Words group.

Delayed Feedback Study. An additional study was conducted during the State Training School field test. The purpose of this study was to investigate the effect of the delay of feedback on acquisition and retention of instructional material during the MCVD presenation of the Identification of Coins Program. Three delay groups were established and 11 subjects were randomly assigned to each group. Table IX.9 shows some of the characteristics of the subjects in these groups.

Feedback was provided for all groups after making a correct response. Group 1 (machine delay only) received feedback in the normal manner after the minimum delay possible with the equipment (approximately 1.5 seconds). Group 2 received feedback after the normal machine delay, plus two seconds.

Table IX.9. Characteristics of Groups: Means and Standard Deviations for subjects who completed an objective.

	Group									
	P&P		MCVD-0		MCVD-2		MCVD-8		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
IQ	30.45	5.91	27.67	5.88	27.58	5.79	29.00	4.60	28.63	5.52
MA	51.72	6.15	52.00	5.91	52.25	9.16	53.18	6.11	52.28	6.79
CAGE	22.81	9.70	25.17	7.57	27.33	8.75	26.46	7.33	25.48	8.28

Group 3 received feedback after the normal delay, plus 8 seconds. The delay values were selected to provide a range of delays. The upper limit of 8 seconds was selected because observation of subjects during a previous field test of the Matching Program showed subjects to be quite easily distracted. Because of this, delays longer than 8 seconds were considered impractical and hence were not included. A search of the literature revealed little useful information to determine these delay times.

Although a limited amount of work has been done with CAI and the mentally retarded, no work has been done to assess the effect of the amount of feedback delay on acquisition or retention of instructional material. In several studies, delayed feedback with normal children has been shown to result in impaired acquisition of material. In these cases, the delay was 12 seconds or more which we determined was too long to retain the student's attention. Other studies reported no statistically significant difference between Ø second and 5 second delays. Based on this, 8 seconds was hypothesized to be short enough to maintain attention and yet long enough to make some difference.

Feedback was in the form of a video displayed puppet which responded

"right, good touching," or more specifically, "Very good, you touched the nickel." Motion feedback depicting children playing, race cars racing, rockets blasting off or humerous animation segments were intermittently displayed, in addition to the puppet's response.

An analysis of covariance was conducted which included the P&P group. The dependent variables were the posttest and the retention test. The retention test was administered 7 days after the posttest. The covariate was the pretest.

The pretest, posttest and retention test were identical paper and pencil tests. The reliability of this test was determined previous to the field test by administering the test to 10 students who had been classified as moderately mentally retarded. An internal consistency coefficient of .83 was obtained through the use of the KR-20 formula, and a test-retest (24 hour separation) resulted in a correlation coefficient of .86.

The results of the analysis of covariance is presented in Table IX.10.

Table IX.10. Means adjusted by covariate, standard deviations and analysis of covariance for three dependent variables.

	Group									
	P&P		MCVD-0		MCVD-2		MCVD-8			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	PROB
PRE	4.45	2.73	6.25	2.53	6.25	3.05	5.46	1.75	1.247	.3047
POST	11.29	2.70	8.36	3.17	7.77	3.83	7.66	4.01	3.202	.033*
RETEN	9.40	2.90	7.40	4.12	7.31	2.74	7.92	3.84	0.973	.415

* Significant at .05 level

The means for posttest and retention test as presented in Table IX.10 have been adjusted by the effect of the covariate: the pretest. As can be seen, groups MCVD-Ø, MCVD-2 and MCVD-8 show virtually identical performance

on post and retention tests, while the P&P group is clearly higher. A Tukey multiple-comparison test was performed to determine the source of the significant F-ratios. The difference between the P&P group mean and the other groups' means were statistically significant at the .05 level.

This comparison is actually of little value since there was such a difference in the number of objectives completed between the P&P group and the other three groups. The number of objectives completed for each group is shown in Table IX.11, and an analysis in which objectives completed is used as a covariate is illustrated in Table IX.7. What is of interest, however, is that the P&P groups' performances fall off considerably on the retention test, resulting in a non-statistically significant F-ratio.

Logan Resource Room Field Test: Time Telling

A field test was conducted in a resource room in Logan, Utah, between April 1 and May 15, 1982. The major purpose of this field test was to obtain data concerning teacher use of the system. The field test at the training school was conducted by IVSET Project staff and did not involve teachers who were independent of the project. In the resource room the teacher was responsible for conducting the field test, and an IVSET Project staff member collected extensive observational data for use in the refinement of the classroom management manual.

There were four first and second grade students involved in this study. Three were classified as learning disabled and one as mildly retarded. The average WISC-R score for the four students was 82.

The Time Telling Program was chosen for this field test for two reasons: (1) of the three programs available, the Time Telling Program was most appropriate for this group of children; and (2) since the Time Telling Program was relatively ineffective at the Training School field test, we were inter-

ested in obtaining additional information with a higher level sample of students.

Four students were selected from a resource room, all of whom could not tell time but could count to 60 by increments of both one and five. This screening was accomplished by administering a pretest in which the students were asked to count by ones and by fives, and they were asked to identify times both in a digital format and on a traditional clockface.

All four students completed the Time Telling Program within the six week period. Pretest results indicated that none of the four students could tell time before starting the program. All four could tell time at the end of the program, as measured by a posttest that was independent of the MCVD system. A retention test identical to the posttest was administered 8 days after the posttest to help determine retention. Figure IX.5 graphically illustrates the progress of the four students, and Table IX.10 shows the post test and retention test scores. Only three of the students were available for the retention test.

In contrast to the training school MCVD groups, the four resource room children finished all 11 objectives within a six week period, while the Training School students completed an average of only 2.09 objectives in an 11 week period.

A great deal of observational data were collected both by the teacher and by the field test coordinator. These data supplied information on the interactions of the system with the student working with the system, the teacher, and the other students in the classroom. A number of changes were made in the location of the system in the classroom during the field test to make the system as unobtrusive as possible. Also earphones were added which not only helped maintain unobtrusiveness, but resulted in better attention spans in the children using the system. These observational data were used

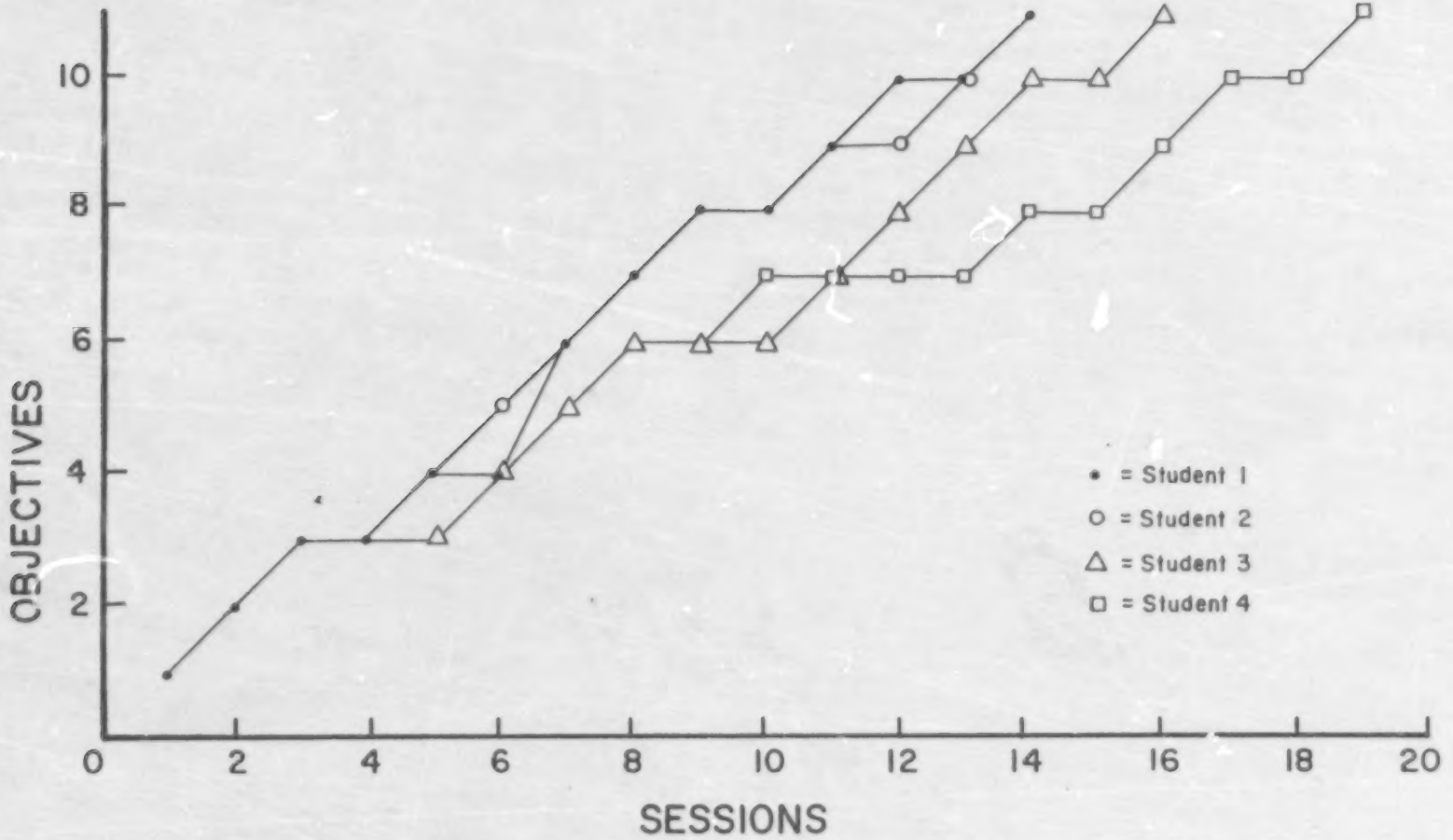

Figure IX.5. Number of objectives attained for each of the four students by number of sessions completed.

in the continued development of the Classroom Management Manual which is included in Appendix H and as a separate document titled User's Guide to the Microcomputer/Videodisc System.

Exceptional Child Center Field Test-Prepositions. The Prepositions Program was designed for use in a resource room with kindergarten and first grade students. Field testing was to occur in resource rooms from the Logan School District in the Fall of 1981. Because of technical and scheduling problems during the videodisc mastering process, an operational videodisc wasn't received until November 1981. Based on past field testing experience, we knew it would be unwise to begin a field test that would be interrupted by the Christmas break, therefore, screening and pretesting didn't begin until January 1982.

Classrooms were selected and permissions attained, although the teachers predicted the students would have attained these skills by January. Pretesting confirmed this prediction. Consequently, it became necessary to wait until the Fall of 1982 to field test the Prepositions Program in a resource room. This delay prompted us to find another population.

A number of alternate field test sites were investigated including a Montesorri classroom, a Headstart classroom, and a classroom at the Exceptional Child Center (ECC). The ECC classroom was selected to obtain additional information on using the system with severely handicapped children. The MCVD system had been improved considerably since field testing had been conducted with moderately and severely mentally and multiply handicapped students. Additionally, the design of the Prepositions Program incorporated information gained from the previous field tests, and we considered it superior to previously tested programs. Since the system had been relatively unsuccessful with severely handicapped individuals, it was a good opportunity to determine if improvements to the system and program would make a difference.

The children in the ECC classroom were considered moderately to severely handicapped. Pretesting was conducted, and seven children were selected who didn't have the necessary skills. The reliability of the pretest instrument had been previously determined. A test/retest conducted with 22 children resulted in an r of .82. A KR-20 spilt half internal consistency test conducted on the first administration resulted in an r of .70. Table IX.11 contains demographic information on these children.

Student Number	Chronological Age in Years	Classification
# 1	5	EMR
# 2	5	TMR
# 3	5	EMR
# 4	4	EMR
# 5	3	EMR
# 6	5	EMR
# 7	4	EMR

Table IX.11. Demographic information of seven students from the Exceptional Child Center. Prepositions field test.

Field testing began on February 1, and concluded on March 11, 1982. Two of the seven children finished the program. The other five were not making sufficient progress to finish in a reasonable time. They were not making progress to warrant continuation. Table IX.12 shows progress information on the six children.

As can be seen from the information on Table IX.13 the MCVD system and program were relatively unsuccessful with this population of students. Observational

Student Number	Total Number of Sessions	Average Session Length in Minutes	Average Number Responses per Session	Average Percent Correct per Session	Total Number Non-Responses	Total Number Teacher Signals	Total Number Objectives Completed	Finished Program Yes / No
# 1	13	6.0	30	67%	0	8	6	Yes
# 2	14	7.0	27	39%	0	36	2	No
# 3	13	6.0	22	44%	5	12	2	No
# 4	15	5.7	18	40 %	2	16	2	No
# 5	15	7.0	32	46 %	0	23	4	No
# 6	15	6.2	25	43 %	2	20	1	No
# 7	14	7.0	31	68 %	1	2	6	Yes
Average	14	6.4	26	50 %	1.4	14	3.9	.3

Table IX.12. Progress information for seven students using Preposition program.

data collected during the field testing indicated that the major problem was maintaining the attention of the children during the session. This also was the major problem encountered with similar populations in previous field tests, and therefore the system and program improvements didn't help with this problem.

As with other field tests, data were collected on every response made by the student. These data will be analyzed to determine if the program can be improved for the resource room field test to be conducted in the fall of 1982.

Logan Resource Room Field Test-Beginning Sight Reading Programs. The Beginning Sight Reading Programs 1 and 2 occupy the same videodisc but are programmed quite differently. Program 1 has extensive remediation sequences available to the student while Program 2 contains minimal remediation sequences. Figures 1 and 2 on pp.41 illustrate the branching logic for each program. Essentially the difference is in the type and amount of remediation the student receives when they respond incorrectly. Both programs respond identically for the first incorrect response. The student receives negative feedback, and then the question is repeated. Negative feedback consists of presenting a blank screen and a voice saying "No, that is not right, try again." On the second incorrect response Program 1 branches to a remediation segment that is a simpler version of the original question. On the third incorrect response Program 1 presents an even simpler version of the original question that prompts the student to the correct answer. If the student responds incorrectly on the fourth time, the teacher is signaled for assistance. This is true for the fourth incorrect response for both programs.

On the second and third incorrect responses Program 2 branches to previous instruction, and on the third incorrect the correct answer is provided.

The programming for Program 2 is similar to traditional programmed instruction sequencing. The programming for Program 1 is based on the hypothesis that the student will progress faster and more effectively if they receive remediation different from the instruction previously encountered. The trade off is that Program 1 requires 3 times more videodisc space than Program 2.

The importance of this question is embedded in the uniqueness of Computer Assisted Instruction (CAI) and/or MCVD instruction, and the scarcity of information available concerning instructional sequencing with CAI and/or MCVD instruction.

These methods of instructional delivery are unique because the instructional developer can't depend on the teacher to determine the appropriate remediation as with the development of print material. The instructional developer has to anticipate the student's needs, and then build the appropriate remediation into the program.

A major goal in the development of MCVD programs is to have them as independent of the teacher as possible. This requires the remediation to be as self sufficient as possible.

A very extensive review of the literature revealed no information concerning instructional sequencing in the development of CAI programs with or without the use of a videodisc player. Consequently, the two beginning sight reading programs were designed to provide information concerning effective instructional sequencing with CAI in general and more specifically with the MCVD system.

To test the hypothesis that the instructional sequencing incorporated in Program 1 would provide more effective instruction and would take less time, two sets of pre and post tests were administered. One set consisted of a paper and pencil test, and the other was administered by the MCVD system. The paper and pencil test is the more important test in terms of generalization.

Reliability of the paper and pencil test was determined by test/retest and internal consistency analysis. The Pearson Product Moment correlation coefficient for the test/retest was 0.90, and the KR-20 internal consistency coefficient was 0.96.

A resource room in each of two different schools was selected. Students were administered the pretest. Students were included if their pretest score was 60% correct or less. The selected students were then randomly assigned to either Program 1 or Program 2 in each classroom. The total N was 32 with 16 from each school.

The three dependent variables used in the analysis were Paper and Pencil (P&P) posttest, MCVD posttest and Total Time on System which is a measure of rate. The major independent variables were Group (Program 1 or Program 2), and the two pretests. Data were also collected on School, Sex, Handicapping Classification, Grade Level, Chronological Age and Number of Sessions. A series of Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA) were conducted which included all of the independent variables as factors in either two or three way analyses. In all cases there were no statistically significant differences on any of the dependent variables. These analysis are available but are not reported herein. Table IX.14 contains Pearson Product Moment correlation coefficients for all variables utilized in the analysis. Table 13 contains the unadjusted means of the dependent variables and covariates by the variables used as factors in the ANCOVA analysis. Tables 15, 16 and 17 contain the results of three of the ANCOVA's conducted with the associated adjusted means.

Statistically significant differences were not detected between the two reading programs on the two posttests, nor were there practically significant differences between the two reading program posttest (Tables 15 and 16). It is interesting to note the gain between the pretests and posttest for both

reading program groups and for both the Paper and Pencil and MCVD tests (see Table 13). With the Paper and Pencil tests the posttest score was more than double the pretest score. Substantial gains were also achieved between the MCVD pretest and posttest scores.

There was a statistically significant difference at the .10 level of significance between the two reading program groups on the Total Time on the System measure. This level of significance is acceptable because of the developmental nature of the evaluation. The difference between the adjusted means is about 4 minutes which is approximately 10% faster than the slower time. This reading program is merely a very small segment of a total reading program. A 10% decrease in time could be quite substantial with the total program. It is also interesting to note that the correlation coefficients (Table 14) for Total Time on the System and the other measures are all statistically significant and negative. This suggests that the faster they progressed through the program, the more they achieved.

Conclusions based on the results reported in this section are reported in Section X.

Factor Variables N = 32		Independent Variables				Dependent Variables		
		Chronological Age in Months	Grade Level	Paper & Pencil Pretest	MCVD Pretest	Paper & Pencil Posttest	MCVD Posttest	Total Time on System
Treatment Group	Program #1 High Remediation	78.17 * 13.80 **	0.60 0.74	40.27 24.90	69.33 26.44	84.87 21.64	83.13 10.11	43.33 6.07
	Program #2 Low Remediation	75.35 8.40	0.29 0.47	34.18 22.02	58.18 22.81	75.94 24.36	79.29 14.49	48.19 8.13
School	School #1	80.06 9.61	0.69 .59	46.19 23.75	70.07 27.48	87.38 22.90	80.94 14.80	46.11 7.77
	School #2	73.91 12.30	0.20 .55	28.26 19.98	57.06 21.07	73.34 22.36	81.32 10.13	45.46 6.26
Sex	Male	76.98 8.97	0.42 .45	35.07 24.97	61.01 18.62	78.93 24.38	78.18 12.45	45.23 8.77
	Female	75.98 8.07	0.43 .37	44.57 13.02	70.55 20.75	81.78 19.47	85.61 12.17	45.94 4.62

* Mean

** Standard Deviation

Table IX.13. Unadjusted means and Standard Deviations for Logan Resource Room.

N = 32	Age of Student	Total Time on System	Paper & Pencil Pretest	Paper & Pencil Posttest	MCVD Pretest	MCVD Posttest
Age of Student	1.00					
Total Time on System	-.35	1.00				
Paper & Pencil Pretest	.69	-.52	1.00			
Paper & Pencil Posttest	.57	-.70	.51	1.00		
MCVD Pretest	.64	-.47	.66	.73	1.00	
MCVD Posttest	.22 *	-.36	.21 *	.46	.41	1.00

* Not significant at the .10 level.
All other coefficient are significant at the .05 level.

Table IX.14. Pearson Product moment correlation coefficients, reading programs combined.

Source of Variation	df	SS	MS	F	Prob.
Type of Program	1	288.27	288.27	.65	.43
Sex of Student	1	112.83	112.83	.26	.62
Interaction AxB	1	47.77	47.77	.11	.75
Covariate	1	3898.90	3898.90	8.03	.006
Error	27	11920.27	441.49		
Total	31	16683.50	538.17		

Table IX.15. ANCOVA-Paper and Pencil posttest with Paper and Pencil pretest as the covariate.

Source of Variation	df	S S	MS	F	Prob.
Type of Program	1	18.60	18.60	.13	.72
Sex of Student	1	257.41	257.41	1.84	.19
Interaction A x 5	1	29.13	29.13	.15	.70
Covariate	1	685.44	685.44	4.91	.03
Error	27	3768.74	139.58		
Total	31	4970.72	158.41		

Table IX.16. ANCOVA-MCVD posttest with MCVD pretest as covariate.

Source of Variation	df	SS	MS	F	Prob.
Treatment Groups	1	114.44	114.44	2.86	.102
Covariate	1	388.33	388.33	9.71	.004
Error	28	1119.44	39.98		
Total	30	1690.19	56.34		
Missing Values = 1		Adjusted Means Program #1 = 43.84 Program #2 = 47.72			

Table IX.17. ANCOVA. Total number of minutes on system by treatment group with paper and pencil pretest as the covariate.

X. CONCLUSIONS

The major purpose of this project was to explore videodisc technology, and to provide information on the appropriateness and effectiveness of utilizing a microcomputer controlled videodisc player to provide computer-assisted instruction (CAI) to mentally handicapped students. Videodisc technology was essentially unexplored.

A commercial version of a videodisc player with random access capabilities (Pioneer Model 7820) became available approximately the same time as this project was started. As part of a pilot project conducted previous to this project, an interface card was developed by the USU Project staff which allowed microcomputer control of a prototype version of the Model 7820 player. As far as we know, this card was the first interface card developed. Little or no knowledge was available about producing videodiscs or the reliability of videodiscs or videodisc players. Consequently, we felt that almost all of the activities undertaken in developing the initial MCVD system and instructional programs were pioneering efforts.

Because of this pioneering, we believe that one of the major contributions resulting from the project is the experience gained in the development process. Therefore, a great deal of this report has addressed that development experience. Our experience should be particularly useful to persons interested in producing instructional MCVD systems and programs. This section contains a summary of our development experience and learning as well as conclusions based on the field tests concerning the systems effectiveness. A section on the necessity of additional research is also included.

Conclusions-Videodisc Production Process

The following conclusions provide a brief summary of the knowledge we gained during the development process. Section VII of this report contains

a more detailed summary of this experience.

1. Team Approach. Designing an interactive videodisc program is a very complex instructional development task especially since we were attempting to develop instructional programs to function independent of the teacher. Because of this teacher independence goal, and because the videodisc is a read only device, it is necessary to anticipate all of the instructional, remediation and reinforcement requirements of an effective instructional program. This requires extensive planning with input from a number of expertise areas; hence, a team approach is a must since it is very unlikely that any one person would possess all the skills necessary to produce an effective program. We found an effective team consisted of (a) a subject matter specialist (Special Education in this case), (b) an instructional developer with expertise in learning theory and instructional design, (c) a media specialist with video production experience, and (d) a computer programmer with microcomputer systems programming experience.

2. Authoring System. It became apparent very early in the development process that an authoring system would be required that could be used with any interactive videodisc program. The programming requirements were too complex and extensive to develop a separate program for each instructional program. The authoring system we developed is described in Section VIII, and more extensively in "A System For the Development and Presentation of Interactive Videodisc Instruction." Additional authoring systems and languages are now available such as Apple's Super PILOT. Use of one of these systems greatly reduces the need for a computer programmer on the development team.

3. Videotape Prototypes. Since the videodisc is a read only medium (contents can't be changed once produced) and relatively expensive to produce ($2500.00 per 30 minute side for a master), field testing prior to producing

(pressing) the videodisc is very desirable. A random access videotape system is useful in this capacity but has some severe limitations (see Section VII) when field testing with students. Nevertheless we have found a random access tape system useful and are currently using one for prototype testing on two other videodisc development projects.

4. Videodisc Storage Capacity. The videodisc is typically advertised as having 54,000 frames per side. This is true but somewhat misleading if audio is required. Audio requires 30 frames per second, and therefore, only 30 minutes is available per side.

5. Second Audio Track. Use of the second audio track can help alleviate some of the storage problems. Both audio tracks can be used if the audio on both tracks can use the same video. This technique was used extensively in all five programs produced under the auspices of the IVSET Project.

6. Premastering. Material to be placed on a videodisc may be in the form of slides, motion film, or videotape, although before a videodisc can be mastered, all source material must be transfered to 1" Type C videotape. If the material can be initially recorded in this format it is preferable. This eliminates at least one generation of tape transfer, and therefore, results in better quality.

7. SMPTE Time Code. Videodisc production equipment with SMPTE Time Coding capabilities is desirable but not necessary in most videodisc production applications. It allows the identification of frame numbers before the videodisc is pressed and returned. SMPTE Time Code is necessary if the videodisc is to contain programming information and program dumps are required.

8. Videodisc Quality. Potentially the videodisc can reproduce extremely high quality video and audio, but this quality is dependent on the quality of the premaster medium. Essentially any flaw in the premaster medium will be

greatly magnified in the final videodisc.

9. Future Production Capabilities. SONY and 3M Companies are now mastering optical videodisc and SONY is also marketing a videodisc player (LDP-1000) that has all the capabilities of the Pioneer 7820. Videodisc production aspects have not changed with these new entries, although the competition will eventually reduce prices for both mastering a disc and purchasing a player.

A read/write videodisc is certainly in the future, but at this point in time it is not possible to predict time, cost or particular capabilities. Xerox and numerous other firms are heavily involved in the development of read/write optical videodiscs but no formal announcements have been made.

A read/write disc will eliminate the need for the random access videotape system for pre-videodisc production field testing, although all other aspects of the production process will remain essentially the same as described in this report.

Conclusions-Field Test Results

1. Instructional Development. One of the most significant findings from the field testing and production processes was the capacity of the MCVD system to provide information for instructional improvement. Since data is collected with each response from the student, a very detailed account of the instructional process is retained. These response data can help pinpoint problem areas with the instructional sequencing as well as provide information on the effectiveness of the reinforcement. This diagnostic process was used a number of times during the present project as previously described in Section IX, but future prospects should be even more fruitful.

We are presently developing software that will assist in the summarization

of the massive accounts of data collected by the system during a field test. This analysis was done manually during the project and was quite time consuming, but through the use of the authoring system, it was relatively simple to modify the instruction logic.

At present we can modify the instructional logic, but of course, cannot change or add to the contents of the videodisc. When read/write videodiscs become available, this limitation will be removed, and a system such as the MCVD system with the addition of a videodisc recorder will provide an instructional developer with an extremely powerful instructional development system.

2. Overlaying Capabilities. Overlaying provides a means for mixing the video signals from both the videodisc player and from the computer. This allows text of computer graphics to be overlayed on a videodisc image. During the Training School field test it became necessary to implement overlaying capabilities. We located a prototype overlay board that allowed us to finish the field test, but the quality of the board was not good. We abandoned the use of that board and are presently investigating other boards. Two other boards are presently available for use with the Apple II but are expensive; in the $2500.00 range. The difficulty is inherent to the Apple's video signal in that it's not a standard NTSC video signal.

The addition of overlaying capabilities provides a great deal of flexibility in developing and altering instruction, and we will continue to pursue various options. Changing microcomputers is one option. It is relatively simple to get overlaying with the TRS-80, but color graphics is sacrificed.

3. Populations. During the course of the project the following populations were involved in the field testing the MCVD system and programs:

a. Elderly Mentally Retarded - Brigham City Day Care Center.

b. Young (4-13 yrs.) severe to moderately mentally retarded
- Excpt. Child Cntr.--Matching
- Excpt. Child Cntr.--Prep.

c. All age severe to moderately mentally retarded
   - Utah State Training School

d. Young (7-9 yrs.) learning disabled and mildly mentally retarded.
   - Resource Room--Time Telling.
   - Resource Room--Beg. Reading.

Investigation of different populations was conducted both to determine if the students learned from using the system and how independently the system functioned. It is a major development goal to have the system as independent of the teacher as possible.

The system was least effective with the young (4-13) severe to moderately mentally retarded students. With both the Matching and Prepositions field test a great deal of teacher intervention was required to keep the students on task. This varied a great deal between children, but in general the system could not be classified as working independently with the child. All six children finished the Matching Program, and two of seven students finished the Preposition Program. Based on this, the children did make progress but at the expense of too much teacher time. Therefore, we conclude that the MCVD system is not appropriate for this population.

The system was most effective with Learning Disabled and Mildly Mentally Retarded (also refered to as EMR) students. In both the Time Telling and Beginning Reading field tests the students completed the programs with little or no teacher intervention. As part of the management plan in the Beginning Reading field test, sixth grade students were used to help the Resource Room students get started with the system. This almost completely eliminated the need for teacher intervention. With this population the MCVD system functioned independently.

It is impossible to generalize about the independence of the system with the population at the Utah State Training School since there was so much variation between students and between programs. There was definitely student aptitude/

treatment interaction evident, but we were not able to identify an indices of aptitude that would discriminate between those students who did well with the system and those who did poorly. The classification information we had available such as IQ scores, mental age, sex and chronological age did not interact with the treatments. This population was classified as moderate to severely mentally retarded (also refered to as TMR). We can only conclude that the system functioned independently with some of these students. The elderly, moderately mentally retarded persons in the Brigham City field test worked independently with the system and all five subject completed all objectives of the program. This was a good population and good environment for the MCVD system. Based on the performance of these subjects, we feel that a group home would also be an appropriate placement for an MCVD system. In many cases it is difficult to procide educational services in a group home setting because of a shortage of trained personnel. With appropriate programs an MCVD system could provide training in survival skills and basic skills without requiring trained personnel.

4. Instructional Characteristics and Effectiveness. As mentioned before, the primary purpose of the project was to explore the use of videodisc technology with handicapped students. The primary purpose of the field tests was to obtain information for system refinement and to help determine the curricular characteristics of the technology for developing effective MCVD instruction. When comparison groups were used, they were used for developmental purposes. We avoided the traditional control group design because of the interpretation and generalization problem inherent with this design. These problems are amplified when dealing with a new technology.

Traditionally, when a new media is developed, educators have rushed in with a host of comparative studies. These studies typically take similar curriculum content and compare the new media presentation against the traditional

media. Because of the often unique instructional interactions occuring between a media and the curriculum content, such studies have rarely yielded anything of practical significance. This type of research should be concerned with determining the instructional and learner characteristics suited to the new media. The following are the instructional and reinforcement characteristics of the MCVD system and programs we found most effective:

a. Positive Feedback. Based primarily on observational data, we determined that motion sequences with music were the most positively reinforcing. We also found that intermittent feedback was more motivational than feedback delivered after each response. Our earlier programs delivered positive feedback after each response. This became more distracting than reinforcing. Subsequent programs used intermittent positive feddback which was more reinforcing, and also influences the rate of presentation (see e.)

b. Negative Feedback. Our earlier programs responded to an incorrect response with the video puppet coming on the screen and saying "No, not right, try again." The puppet was actually reinforcing for some students and was ineffective punishment. The Reading and Prepositions programs respond to an incorrect response with a blank screen and a voice saying "No, try again," or just "No." We found that the least amount of feedback after an incorrect response was the most effective negative feedback. The effectiveness of both types of feedback needs a great deal more research. We are continuing to analyze our field test data to help substantiate or dispell our observational data analysis.

c. Delayed Feedback. The Identification of Coins Program field tested at the State Training School involved four groups; one Paper and Pencil and three MCVD groups. Two of the MCVD groups received delayed feedback of 2 seconds and 8 seconds. There was not statistically or practically significant differences between the three MCVD groups on either the posttest or the

retention test.

d. Audio Feedback. Two types of audio feedback were delivered by the system. Audio from the videodisc has been discussed, but there was also audio from the computer which consisted of a beep when the system was ready for the student to respond. This beep signal was included primarily to restrain the student from responding before the system was ready to receive a response. A spin off from the beep is that it helped maintain the attention of the student. It is now included in all MCVD programs.

e. Rate of Presentation. Based on research findings in the literature on the rate of presentation with traditional types of instruction, and on our own observations we attempted to increase the rate of presentation of instruction with the Reading and Prepositions programs. This was accomplished by physically placing positive feedback segments immediately after each instruction segment on the videodisc. This method uses more videodisc space, but it greatly increases the rate of presentation when the student makes a correct response. Upon responding correctly the student's correctness is confirmed immediately, and then the next instructional segment is presented. Since the instruction and feedback segments are placed in a linear arrangement on the videodisc, no searching is required, and consequently, positive feedback is immediate.

The results from the Prepositions field test are inconclusive concerning rate of presentation because of problems with the population (see earlier discussion of Prepositions field test). This will be a major area of investigation when the program is field tested in a resource room. The results of the Reading field test are much more conclusive.

The primary purpose of the Reading field test was to investigate the difference between the two remediation methods built into the two reading programs. We found no differences between the effectiveness based on comparing

posttest score, but based on pretest to posttest gain, these programs were our most effective programs. With the Paper and Pencil tests the pretest score was more than doubled (see Table 12). A t test for correlated means is significant at the .001 level. Both programs, Program #1 (high remediation) and Program #2 (low remediation), were designed to provide instruction as rapidly as possible. We attribute the success of these programs primarily to this relatively rapid rate of presentation.

f. Instructional Effectiveness. Because of the formative nature of the evaluations, and the resulting research designs, generalization beyond the actual samples will not be made. However, based on pretest to posttest gains, we can conclude that both statistically and practically (educationally) significant learning was evident with the following programs:

1.	Matching	Brigham City	Elderly TMR	Fig. 7
2.	Id. of Coins	Training School	All age TMR	Table 3
3.	Fnctl. Words	Training School	All age TMR	Table 3
4.	Time Telling	Logan Res. Room	Young LD	Table 11
5.	Beg. Reading	Logan Res. Room	Young LD	Table 14

5. System Reliability. Reliability of the system was a problem during the Training School field tests. A system failure occured on the average of two per day for the entire field test. The least dependable were the prototype units we either developed or purchased as prototypes. The Apple II system, touchpanel, monitor and videodisc player were very reliable. Most of the bugs in the weak parts of the system were located and eliminated, and during the next field test, breakdowns averaged one every other day. During the final two field tests, two systems operated for a total of twenty days without a breakdown. The system in its present form is very reliable.

6. Teacher Training. During the Time Telling field test, the resource room teacher was able to use the system after one hour of training. A prototype classroom management manual was made available to the teacher during

the course of the field test. The teacher found the manual useful in operating the system and numerous suggestions for improvement were obtained. The final version of the Classroom Management Manual is included as an attachment to this report and was used during the Beginning Reading and Prepositions field tests.

7. Cost Effectiveness. At current prices, the cost of purchasing and operating an MCVD system over a three year period follows:

a.	Pioneer 7820 III Videodisc Player	$2500.00
b.	Apple II Plus, dual disk drives, 48K and Language Card.	2400.00
c.	Printer and Printer Card	800.00
d.	Touchpanel and Installation	1500.00
e.	Color Monitor	700.00
	Total Purchase Cost	$8100.00

Over a three year period using a cost of money of 12% per annum, the yearly purchase cost of equipment would be $11589.00/3=$3863.00. Annual maintenance charges will be approximately $485.00 and supplies are approximately $200.00 per year. The total yearly cost is estimated at $4548.00.

The cost of a teacher could be used for comparison purposes, but in general a trained aide could conduct the type of instruction representative of typical MCVD instruction. Therefore, the cost of an aide will be used.

The hourly wage for a trained aide varies greatly. We found a range of $3.50 to $8.00 per hour. For the purpose of this comparison we'll use $5.00 per hour which is the rate used at the Exceptional Child Center. An aide hired for 6 hours per day with 12% benefits would cost approximately $8870.00 per year. Based on these figures an aide would cost approximately the same as two MCVD systems. Obviously there are numerous activities an aide can handle in a special education setting that can't be handled with the MCVD system. Based on the Training School field test, the students learn faster with an aide but not necessarily better. The cost comparison has the most

meaning if we look at the future.

First, the system and programs we developed were in a developmental stage. The programs we developed were improved greatly during the course of the project and improvement will continue. Second, if current trends in educational funding continue, fewer dollars will be available for educating handicapped students. Education is very labor intensive, and cost cutting measures will effect employment. Therefore, alternatives for providing education must be explored and identified. An MCVD type system is an alternative.

Computer hardware costs have been decreasing rapidly and will continue to decrease. Also videodisc players are expected to decrease in price. The touch panel we use is prototypical and should decrease dramatically in price. The monitor and printer are fairly stable and should see little price change. The videodisc player will also become more "intelligent". SONY's next videodisc player will contain a programmable 64K microprocessor. It is very likely that external computer control can be completely eliminated in the near future.

Consequently, within 5 years an MCVD system more powerful than the one field tested during this project will cost less than half the cost we projected. Publishers are showing a great deal of interest in developing CAI and videodisc programs. Within 5 years low cost programs covering a wide range of subject areas should be available.

Thse projections have a great deal of implication especially if we continue to experience tight budgets in education. The cost of labor is increasing and the cost of MCVD equipment is decreasing.

6. Future Research. As with most projects of this type, more questions were uncovered than answered. A great deal of research is necessary to determine the full potential of the MCVD system as an instructional delivery system. Most importantly, research is required to identify the effective and ineffective

characteristics of this type of instructional delivery system. We need a great deal more information concerning instructional sequencing, remediation and feedback. If an MCVD system is to be independent of the teacher, these components of instruction have to be administered by the system. For the MCVD system to be an effective delivery system it must allow the student to word independently and free the teacher to do those things only a human can do.

It is of little surprise that the need for individualized attention increases with the severity of the handicapping condition. Yet, short of providing one teacher for every student, educators of the handicapped are constantly faced with their student's educational dependence as a major obstacle to individualization within the classroom. That is, given the lack of independent learning skills of special needs of students, teachers search for educationally beneficial ways for students to spend their time independently while other students are receiving individual or small group instruction. We firmly believe the MCVD system can provide individualized and independent instruction and provide it effectively, but it is a huge challenge to the instructional developer. The system can handle it now. With additional information from additional research the instructional designer can also provide the instruction to produce an effective instructional delivery system.

XI. DISSEMINATION AND DEMONSTRATION

Introduction

Major dissemination activities of the project have included presentations at state and national conferences, articles published in journals, and continuous distribution of both published and unpublished project-related articles. Presentation and publications of project staff are listed below. While exact numbers of both written and telephoned requests for information have not been maintained, it is estimated the project staff responded to approximately 3 request a week in the first year of the project and 10 requests per week in the second year. As this report is being written, approximately 15 requests for information are responded to each week.

Articles and Presentations

Hofmeister, A. (with Thorkildsen, R.) Videodisc Technology and the Preparation of Special Education Teachers. Teacher Education and Special Education, 1981, Vol. 4, No. 3, pp. 34-39.

Thorkildsen, R. Microcomputer/Videodisc-Implications for Instructional Design. Paper presented at the Association of Media Producers, Chicago, October 1979.

_____. Microcomputer/Videodisc-Implications for Special Education. Paper presented at the Society for Applied Learning Technology Conference, Washington, D.C.

_____. A Microcomputer Controlled Videodisc Instructional Program for Mentally Handicapped Children. Paper presented at the University of Montana's Computers in Education Conference, Missoula, March 1980.

_____. (with Williams, J.G.) Microcomputer/Videodisc: Interactive CAI for the Mentally Handicapped. Presentation and demonstration at the Information Technology in Education Congressional Hearings sponsored by the U.S. House of Representatives Subcommittee on Science, Research and Technology and Subcommittee on Select Education, Washington, D.C., April 1980.

_____. Microcomputers and Videodiscs: Special Education Applications. Paper presented at the national meeting of the Association for Educational Communications and Technology, Denver, April 1980.

_____. IVSET Project Update-Field Test Results. Paper presented at the national meeting of the Association for Special Education Technology, Denver, April 1980.

Thorkildsen, R. Computer Assisted Instruction for Severely Handicapped Learners Utilizing a Microcomputer and Random Access Videodisc Player. Paper presented at the National Conference of the Association for the Severely Handicapped, Los Angeles, November 1980.

_____. Field Test Results--Microcomputer/Videodisc Computer Assisted Instruction System for Mentally Handicapped Learners. Paper presented at the Council for Exceptional Children National Conference, New York, April 1981.

_____. Intelligent Videodisc--Implications for Education and Using a Microcomputer/Videodisc System in Reading Programs for Exceptional Children. Two papers presented at the San Deigo State University, 1981, Microcomputer Institute, San Diego, July 1981.

_____. (with Williams, J.G. and Bickle, W.K.) Implications for Videodisc/Microcomputer Instructional Systems for Special Education. Technical paper 45. Exceptional Child Center.

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Allard, K. An Interactive Videodisc System for Special Education. Paper presented at American Association for Mental Deficiency. Tuscon, Arizona, October 1981.

Allard, K. Designing an Interactive Videodisc. Paper presented at Association for Education Communications Technology, Philadephia, April 1981.

_____. (with Thorkildsen, R.) Intelligent Videodisc for Special Education. Videodisc News, Washington, D.C., April 1981.

_____. Preliminary Courseware Design Considerations in Videodisc Development. Paper presented at West Coast Computer Faire, San Francisco, March 1980.

Demonstration Classroom

During the course of the project, demonstration classrooms have been established and conducted at the Exceptional Child Center and at the Brigham City Day Care Center.

The Brigham City Center is a program for mentally retarded adults. This field site is not presently in operation since all of the residents have completed the programs. We anticipate using this site again when new programs are available.

The field site at the Exceptional Child Center is presently in operation and will continue. This site is available for persons who are interested in seeing the system in operation. On site demonstrations are presently being conducted on the average of one per week for groups or individuals.

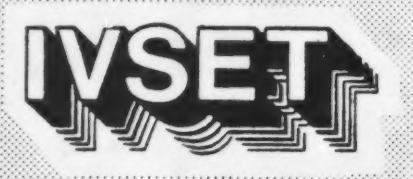
IVSET Project Staff and Titles

Ron Thorkildsen	Project Director
Alan Hofmeister	Co-Director
Kim Allard	Production Coordinator/ Instructional Programmer
Russell Awakuni	Computer Programmer
Susan Friedman	Instructional Programmer
Penny Hansen	Instructional Programmer
Pam Mitchell	Secretary
Pat Walker	Instructional Programmer
Carol Walker	Secretary
Joe Williams	Computer Programmer

Appendix A

USER'S GUIDE TO THE MICROCOMPUTER/VIDEODISC SYSTEM

User's Guide to the Microcomputer/ Videodisc System



Interactive Videodisc for
Special Education Technology
1981 Utah State University

User's Guide to the Microcomputer/Videodisc System

Interactive Videodisc
for
Special Education Technology
1981

Prepared by:

Kim E. Allard
Project Coordinator

Project Directors:

Ron Thorkildsen
Alan Hofmeister

IVSET Project
Exceptional Child Center
UMC 68
Utah State University
Logan, Utah 84322

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Introduction to the Interactive Videodisc for Special Education Technology (IVSET) System

The microcomputer/videodisc system is a computer assisted instruction (CAI) system utilizing the rich variety of audio and video images available on a videodisc. Differing from past CAI applications, this system and accompanying packages are designed with the non-reader in mind. Students interact with the system by touching the television screen instead of using the keyboard. By design, these features make the IVSET system uniquely appropriate for special education populations. Packages developed for use on the IVSET system are included in the appendices of this manual.

Purpose of the User's Guide

This user's guide was written to help you get the most out of the IVSET system. A fully illustrated equipment set-up section describes in step-by-step fashion how to set up the microcomputer/videodisc system. System operation has also been illustrated in a step-by-step format. A section of the user's guide has been devoted to teaching students how to work with the system as well as integrating the IVSET system into classroom environment. The appendices contain program objectives, prerequisite skills and lesson objectives for individual instructional packages developed for the IVSET system. The purpose of this user's guide is not to dictate how the system should be used, but rather to help you integrate it into your classroom. Hopefully, you will find it a useful introduction and reference.

Setting up the System

Equipment

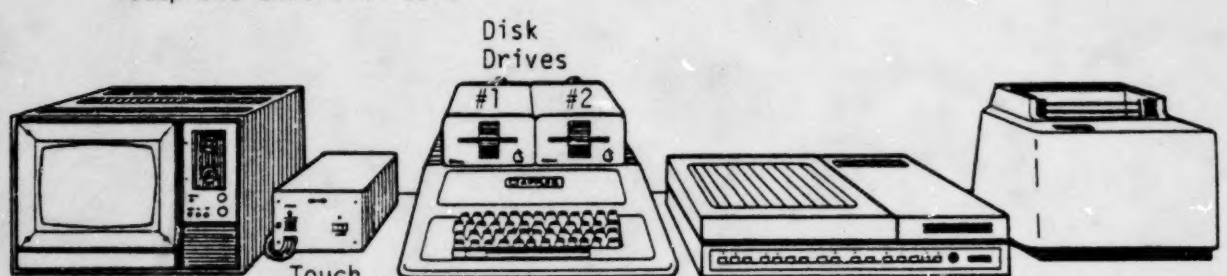
1 Apple II Microcomputer
2 Floppy Disk Drives
1 Videodisc Player (DVA 7820, Model 3)
1 Modified Sony Television with front mounted Touch Panel
1 Carroll Touch Panel Control Box
1 Paper Tiger Printer
1 Sup'R Mod Whisper Fan
2 Monaural Headphones
1 Six outlet power bar with on/off switch

Circuit Boards

1 Apple Language Board
1 Parallel Interface Board
1 Mountain Hardware Clock Card
1 Allen Communications Videodisc Microcomputer Interface Board w/junction box
1 Symtec Video Processor Board (optional)
1 Apple Disk II Controller Board

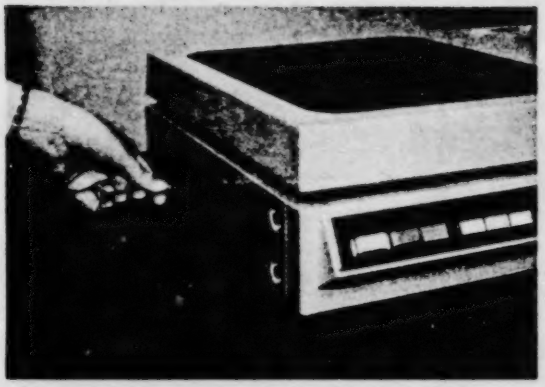
Cables

2 BNC to BNC Coaxial cables (Note: These cables are of different lengths, p.**10**)
1 Male RCA mini to Male RCA mini audio cable (p. **4**)
1 "26 pin" Amphenol to 12 pin female ribbon cable (p. **7**)
1 BNC to male RCA mini coaxial cable (p. **9**)
1 "25 pin" male to 10 pin female ribbon cable (p. **8**)
1 Multicolored ribbon cable connected to the television monitor (p.**12**)
1 Apple power cable
1 Videodisc power cable
1 Touch panel control box power cable
Other power cables are not detachable
Headphone extension cord



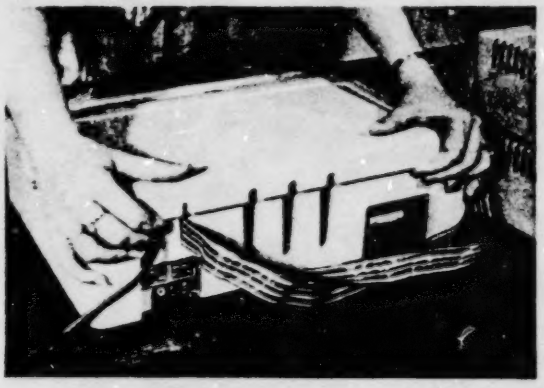
1. POSITION EACH PIECE OF EQUIPMENT WHERE YOU INTEND TO USE IT. The most common arrangement is shown above.

2. UNLOCK THE VIDEODISC TURNTABLE. This is very important! The turntable should always be locked before moving and unlocked before being plugged in. To unlock the player, locate the screw in the small hole on its left side. Using the screw driver supplied with the system, gently turn the screw counter-clockwise until it seems to pop out toward you.

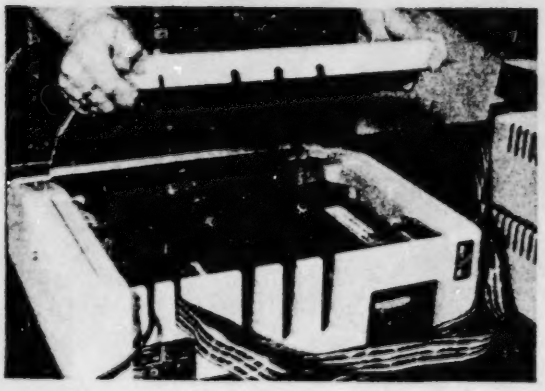


3. If the disk drives are on top of the Apple, remove them. To open the Apple, place your hands at the back of the cover hooking your fingers beneath the lip.

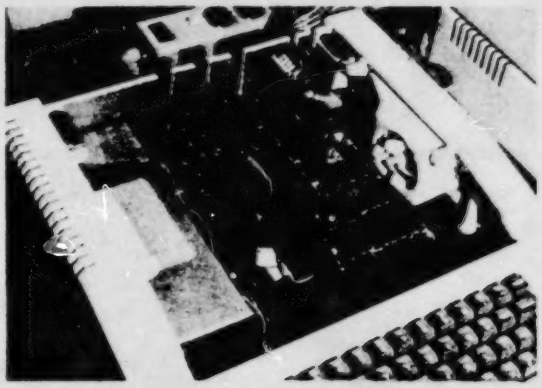
4. Rotate your wrists until the cover panel gives in to your forefingers.



5. When the cover releases, pull it forward towards you. Be careful not to drop the front in the workings of the Apple. Put the cover aside.

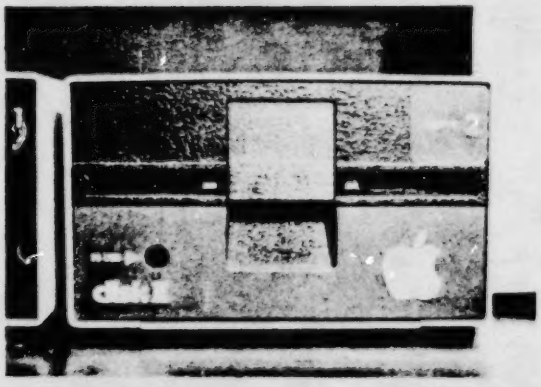


6. The inside of the Apple looks like this.
Each of the green circuit boards sitting in the rear of the Apple serves a particular function in the microcomputer/videodisc system. For a description of each board, its function and location, see page **18** . Also, notice the whisper fan located on the right side of the Apple. It has an electrical cord which extends out the rear of the Apple.

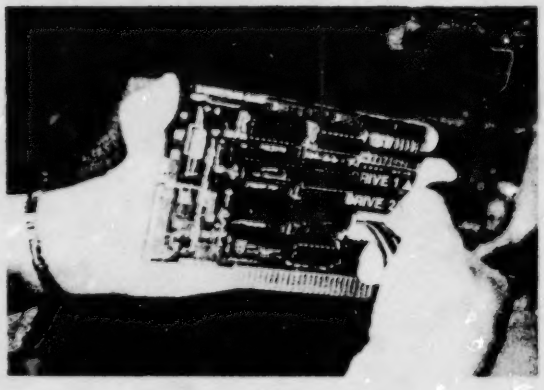


7. The circuit board that controls the disk drives is located in slot #6. Gently wiggle this card out of its slot.

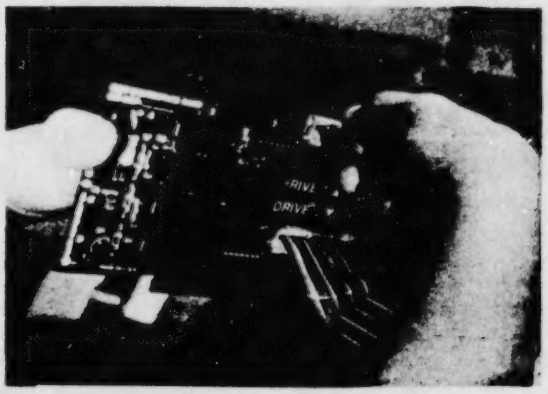
8. Disk Drive #2 is identified by a label on the front of the drive.



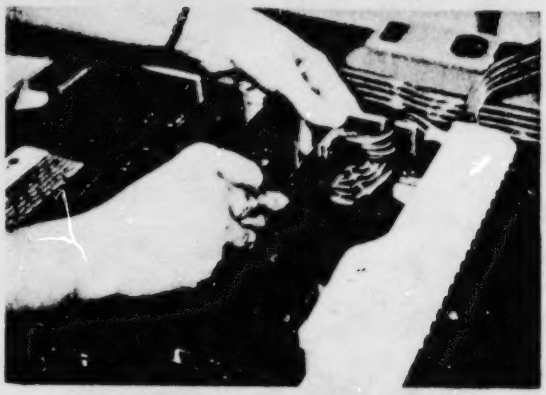
9. Connect the flat multicolored ribbon cable from Disk Drive #2 to the pins on the Disk II interface board labelled Drive #2. Be careful to line up the pins with the holes on the connector. MISMATCHING THE PINS AND HOLES WILL RESULT IN SEVERE DAMAGE TO THE DISK DRIVES WHEN THE POWER IS TURNED ON.



10. Connect Disk Drive #1 to the pins labelled Drive #1. Inspect both cable connections to be sure the holes on the cables are exactly matched to the pins on the Disk II interface board.

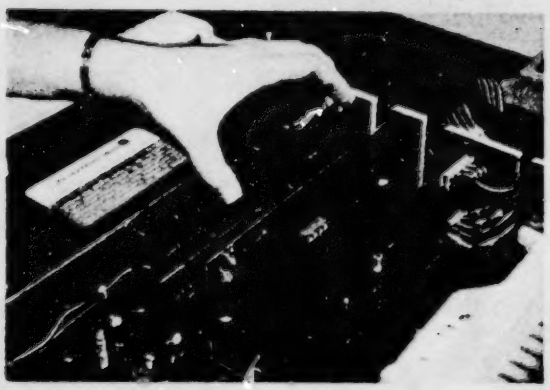


11. Gently wiggle the Disk II interface board back into slot #6. Press firmly on the front and rear of the board to be sure it is seated correctly.

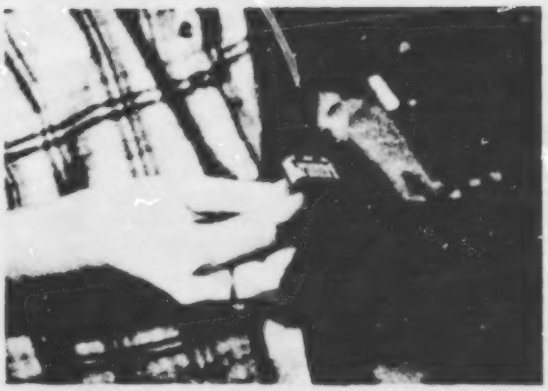


12. Run the attached cables out through the cut outs in the back of the Apple.

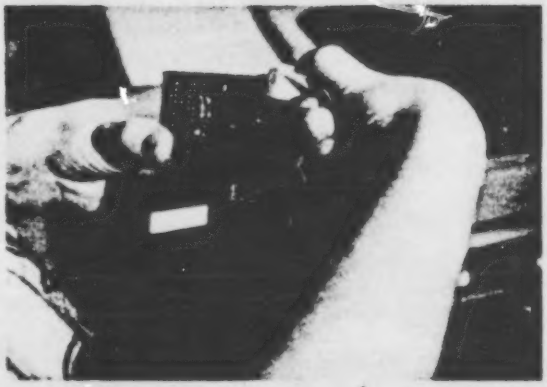
13. Remove the parallel interface board from slot #1 of the Apple.



14. Next, locate the flat gray ribbon cable that is connected to the printer.

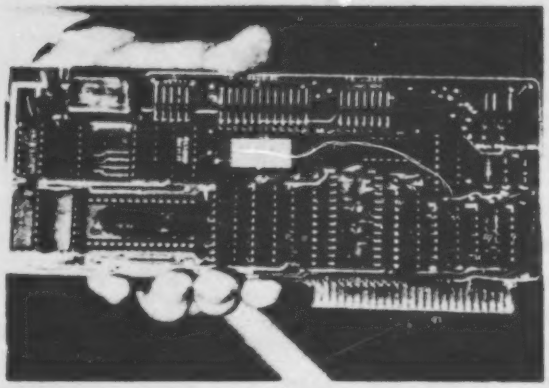


15. Connect the female pin connector to the pins of the parallel interface board. Again, be sure the pins are <u>exactly</u> lined up with the connector.



16. Replace the board in slot #1.

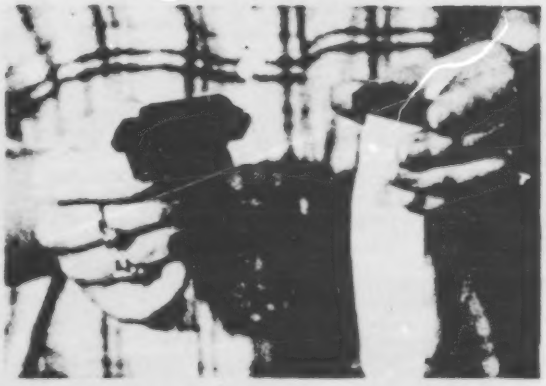
17. Remove the videodisc/microcomputer interface (VMI) board from slot #3. This board has pins for three different connectors.



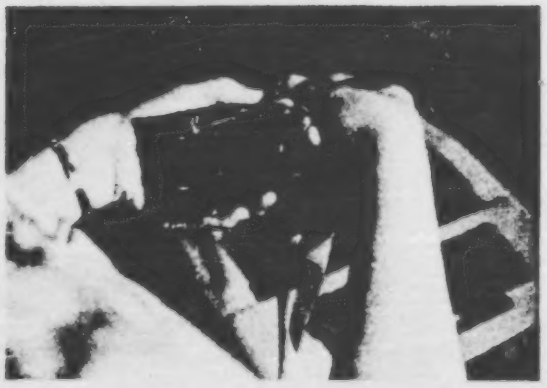
18. This is the VMI junction box. Locate the flat gray cable connected to the box.

19. Connect the gray cable to the set of pins labelled TO VIDEO JUNC. BOX.

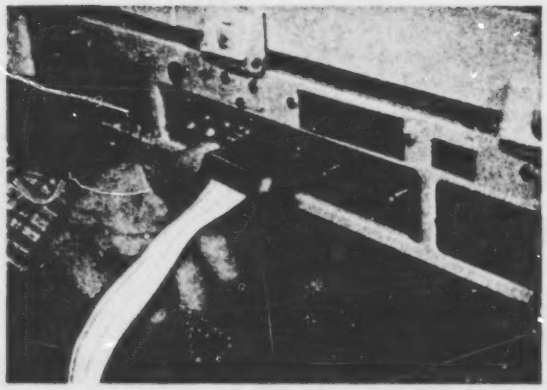
20. Locate the flat multicolored cable with a 12 pin female connector on one end and an Amphenol connector on the other.



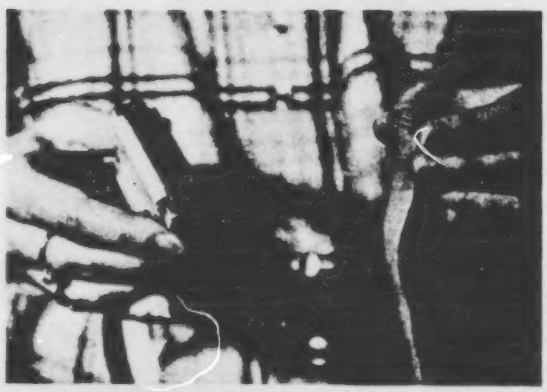
21. Connect the 12 pin female connector to the set of pins labelled TO VIDEO-DISC.



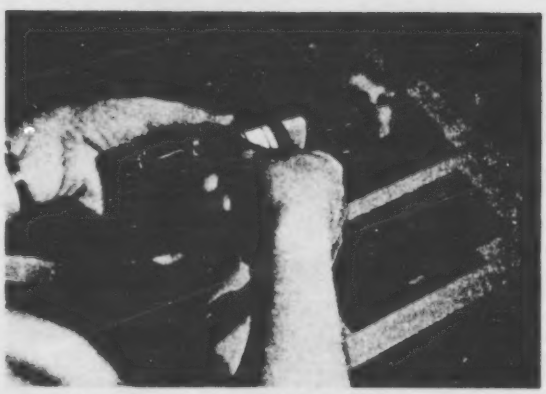
22. Connect the Amphenol end to the EXT CONTROL jack on the videodisc player.



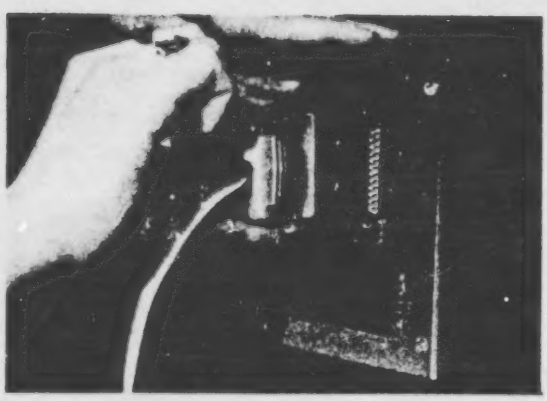
23. Now, locate the flat cable with a 10 pin female connector on one end and a 25 pin male connector on the other.



24. Connect the 10 pin female connector to the set of pins labelled RS232.

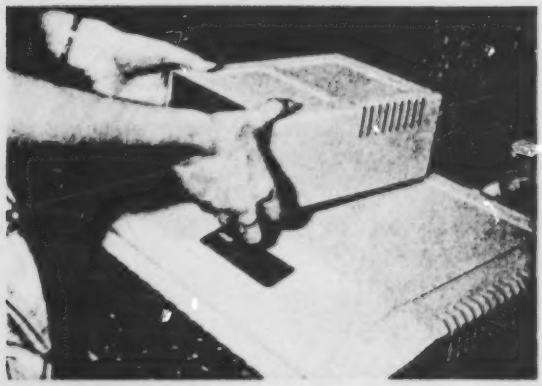


25. Connect the other end of this cable to the jack labelled LINE on the back of the touch panel control box.

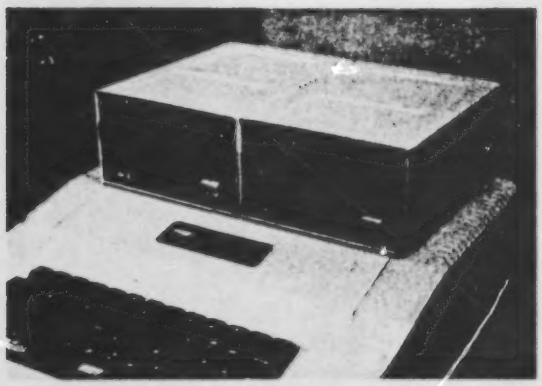


26. Slide the VMI board back into slot #3. Run the cables out through the cut outs in the back of the Apple and replace the cover.

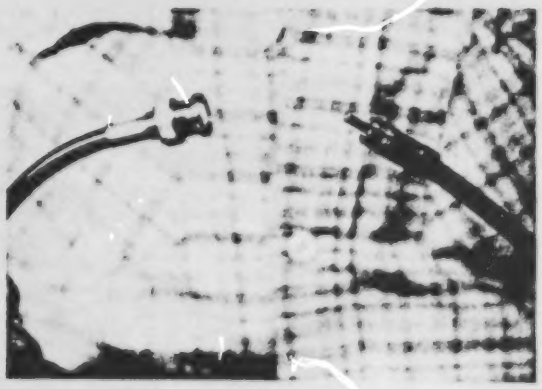
27. Place Disk Drive #1 on top of the Apple.



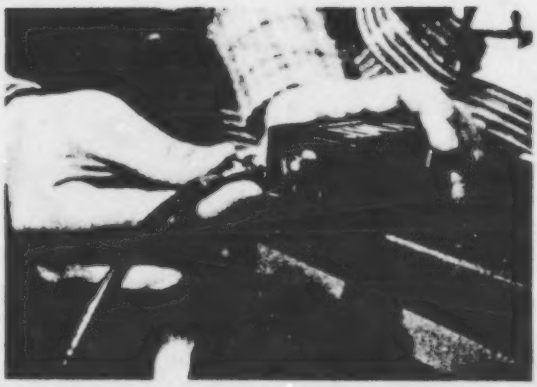
28. Place Disk Drive #2 next to #1.



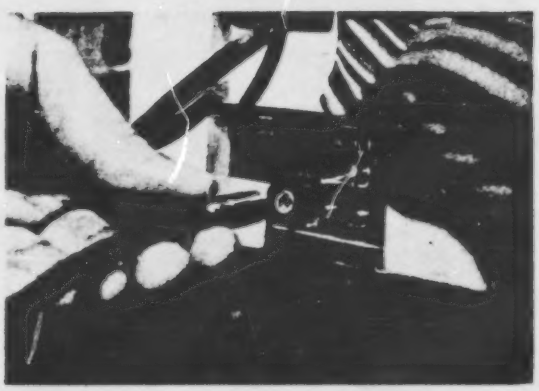
29. Locate the round coaxial cable with a male RCA mini on one end and a BNC connector on the other.



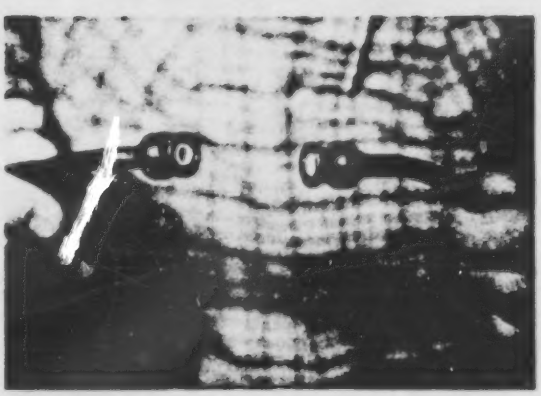
30. Attach the BNC connector to the jack on the VMI junction box labelled COM.



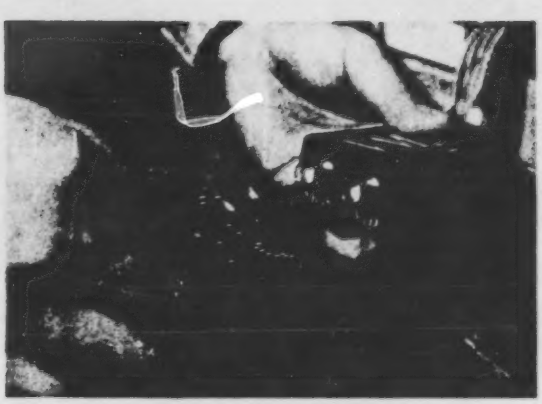
31. Plug the male RCA mini end into the jack labelled VIDEO OUT on the Apple.



32. Locate a cable with BNC connectors on both ends.

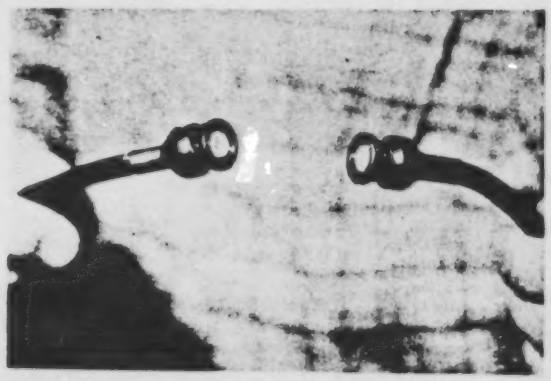


33. Connect one BNC end to the jack on the VMI junction box labelled MON.

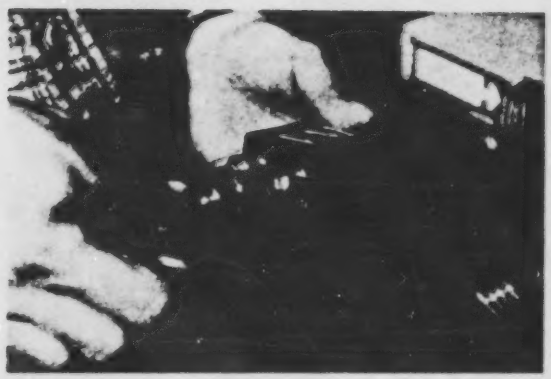


34. Connect the other BNC end to the video "LINE IN" jack on the television. Note: On some televisions the jack may not be a BNC type. In this case, an adaptor will be necessary.

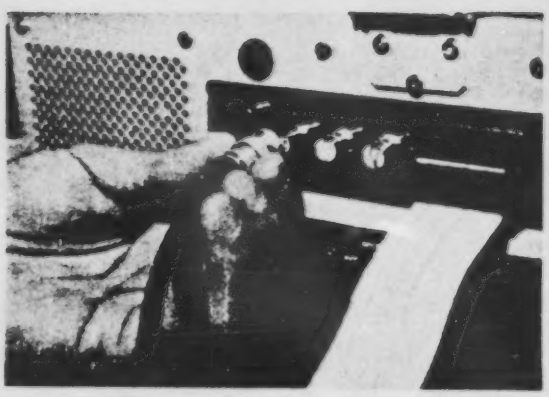
35. Locate the other cable with BNC connectors on both ends.



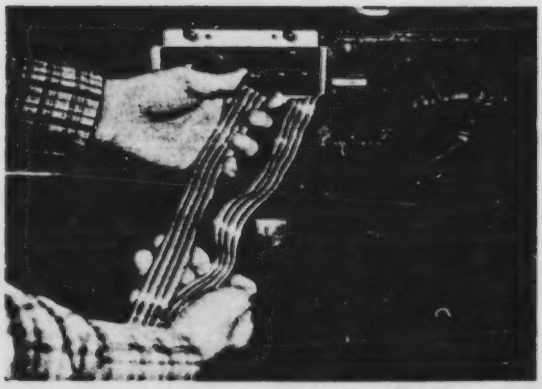
36. Connect one BNC end to the jack labelled VID on the VMI junction box.



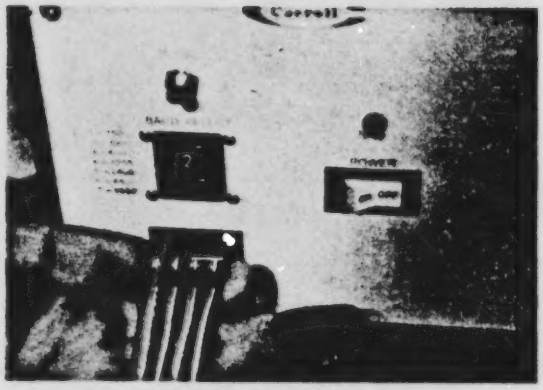
37. Connect the other BNC end to the jack labelled VIDEO OUT on the videodisc player.



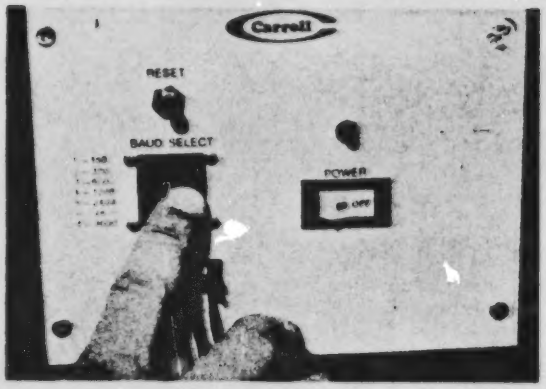
38. Locate the multicolored ribbon cable attached to the back of the television monitor.



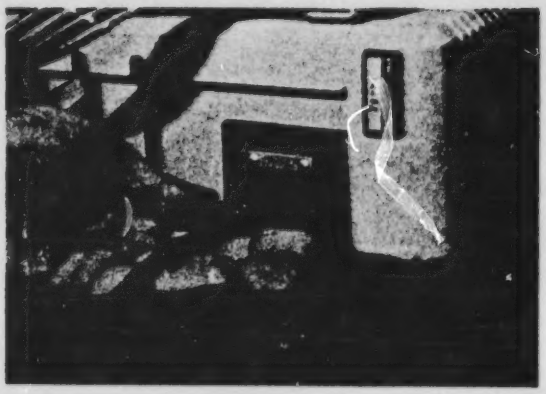
39. Connect this cable to the front of the touch panel control box. NOTE: The cable will not connect if it is upside down.



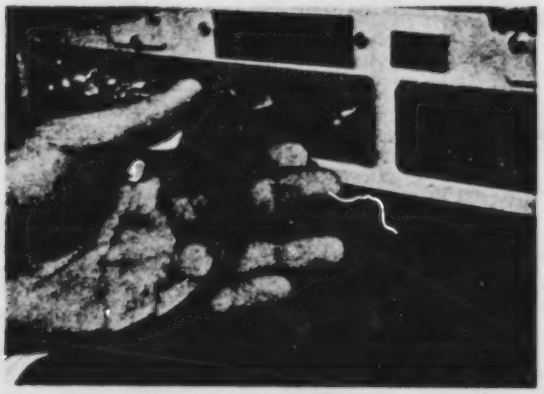
40. At this time, check to see that the "baud select" window shows a number 2. If this is not the case, rotate the switch in the window until the number 2 appears.



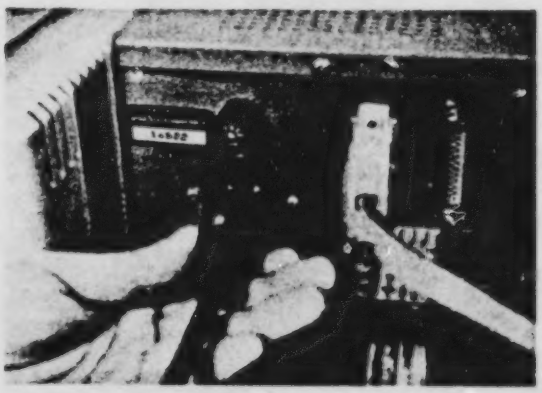
41. Connect the power cord to the Apple.



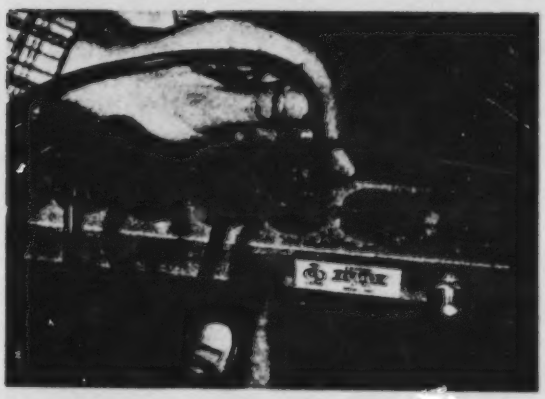
42. Connect the power cord to the videodisc player.



43. Plug the power cord into the back of the touch panel control box.



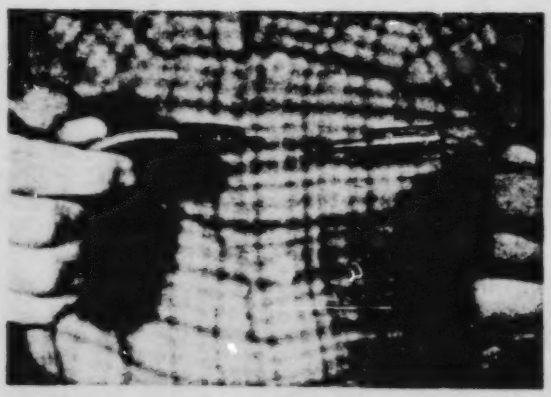
44. Plug the monitor, the touch panel control box, the Apple, the videodisc, the printer and the whisper fan into the outlet bar. Be sure the outlet bar is turned off.



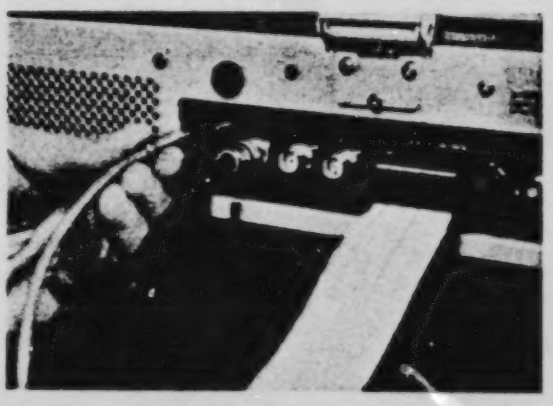
45. Plug the outlet bar into the wall. NOTE: Be sure your outlet is grounded. If you must use a three-prong adapter, loosen the outlet screw and ground the plug.

46. You now need to hook up the audio component of the system. At this time, you have two choices, you may set the system up to (A) play audio through the television speaker or (B) use headphones.

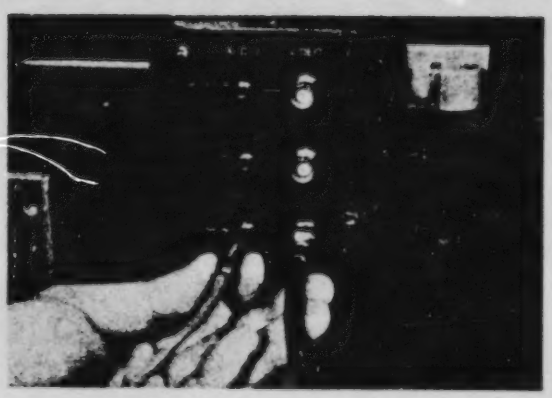
47. A. TO PLAY AUDIO THROUGH THE TELEVISION.
(1) Locate the cable with a male mini plug on one end and a male RCA mini plug on the other end.



48. (2) Plug the male RCA mini plug into the jack labelled CH 1 AUDIO OUT on the videodisc player.

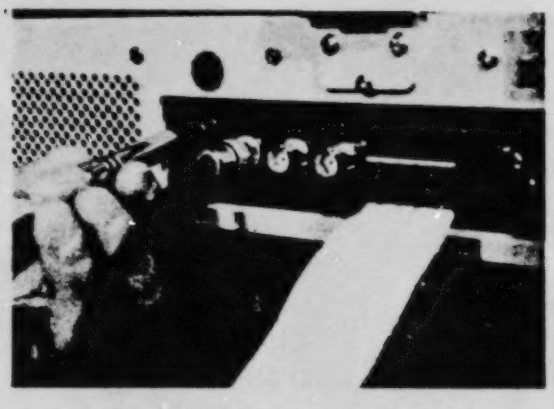


49. (3) Plug the other end into the jack labelled audio LINE IN on the television.

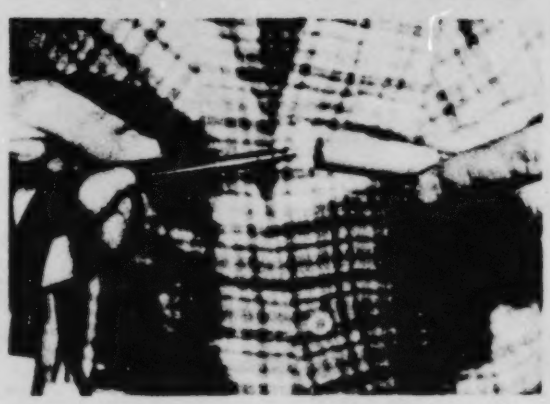


50. B. TO PLAY AUDIO THROUGH THE HEADPHONES.
(1) Locate the Y cable.

51. (2) Plug the male RCA mini plug into the CH 1 AUDIO OUT jack on the videodisc player.

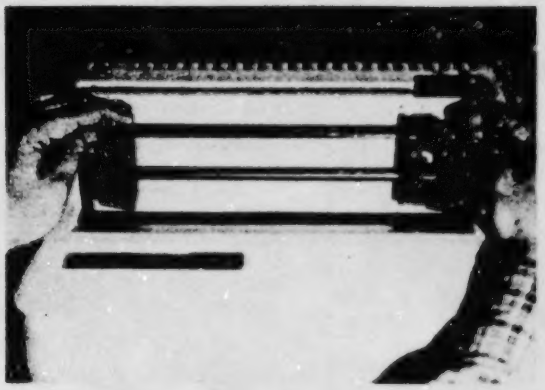


52. (3) Plug the headphones into the female 1/4" phono plugs. An extension cord is available for the second set of headphones. This set is included to allow observation of student interaction with minimal classroom disruption.

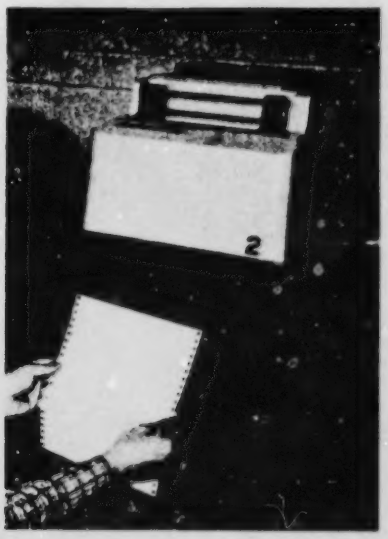


Putting Paper in the Printer

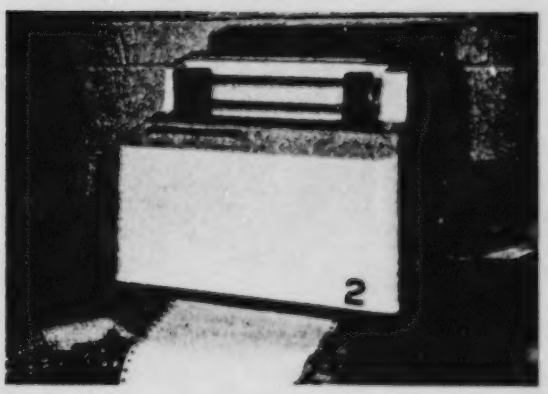
The last task you must complete is loading paper into the printer. To load the printer:



1. Open the clamps which hold the paper on the feeding pins.

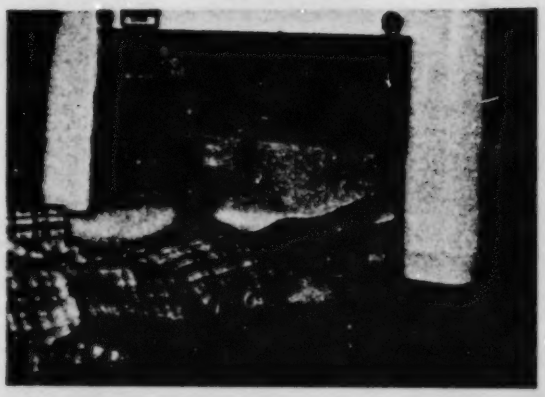


2. Place the paper on the floor in front of the printer.

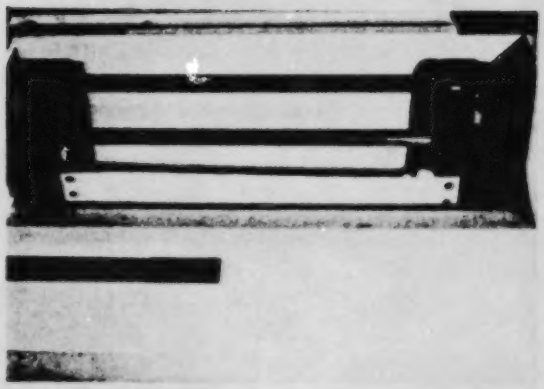


3. Slide the top of the paper underneath the printer.

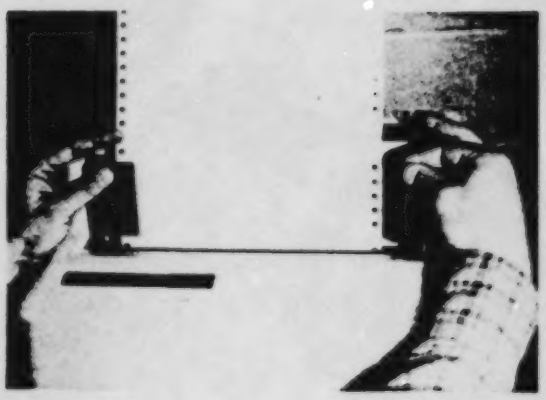
4. Reach around the printer and press the paper against the flat back surface of the printer.



5. Gently slide the paper up until it appears behind the printer ribbon in the front of the printer.



6. Fit the holes in the paper over the pins and release the clamp.Do the same with the other clamp.



Microcomputer Circuit Boards

With the Apple cover off, you will notice the green circuit boards sitting in slots in the rear of the Apple. NEVER TOUCH ANY OF THESE CIRCUIT BOARDS WITH THE APPLE POWER ON. Pulling a circuit board out of the Apple while the power is on will result in damage to the Apple and the boards. From left to right, the slots are labelled #0-#7. The circuit boards are obligated to the slots as follows:

SLOT 0 - Apple Language Board

SLOT 1 - Parallel Interface Board (for use with printer)

SLOT 2 - Mountain Hardware Clock Card

SLOT 3 - VMI Videodisc Interface Board

SLOT 4 - Symtec Video Processor Board (optional)

SLOT 5 - Empty

SLOT 6 - Apple Disk II Controller Board

SLOT 7 - Empty

This information is provided for reference only. It is not recommended that boards be removed from or inserted in the Apple after initial set up unless an authorized service person is present.

Operating the System

Selecting a Package

Each IVSET Package contains:

1 or more videodiscs.

1 or more floppy diskettes which control the microcomputer/ videodisc system. These diskettes are labelled PACKAGE CONTROL DISKETTE.

1 or more BACK-UP PACKAGE CONTROL DISKETTES. These diskettes are duplicates to be used in case of failure of an original.

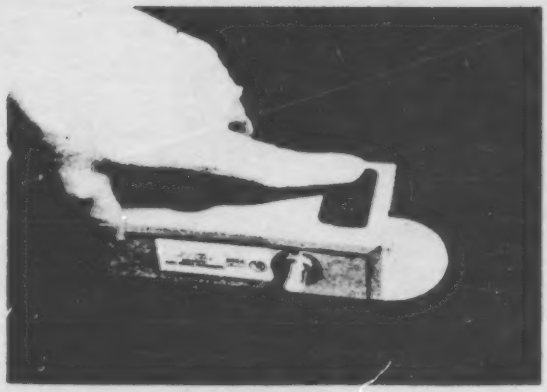
1 floppy diskette which is used to format blank diskettes for use as STUDENT DATA DISKETTES. This diskette is labelled FORMATTER UTILITY.

5 Blank floppy diskettes for storing student data. These diskettes are labelled STUDENT DATA DISKETTE.

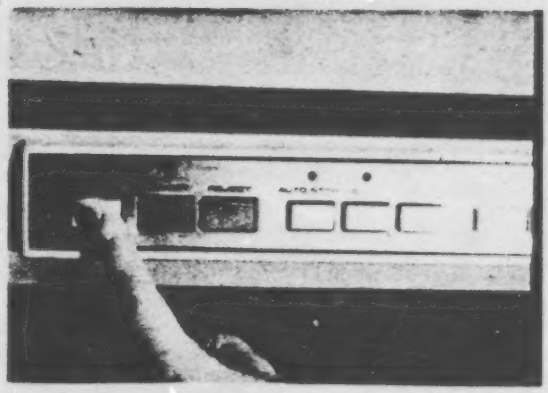
Information on the instructional package.

Changing the Videodisc

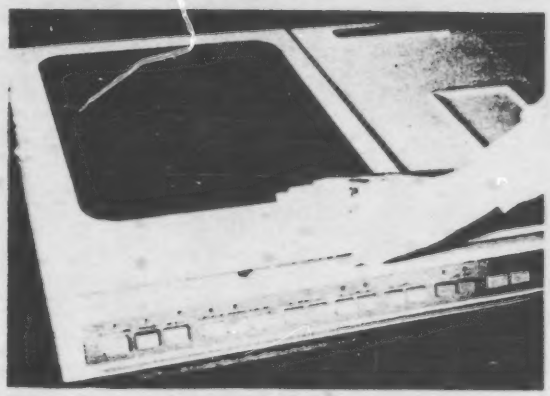
1. Turn the outlet bar power switch to the "ON" position. Be sure the power switch on the player is on. A green light should show.



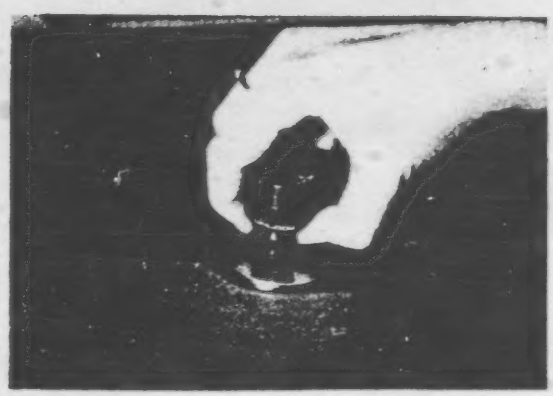
2. Open the videodisc lid by pressing the white button labelled "COVER OPEN". The lid will spring open slightly. If the cover does not spring open, you do not have the power on.



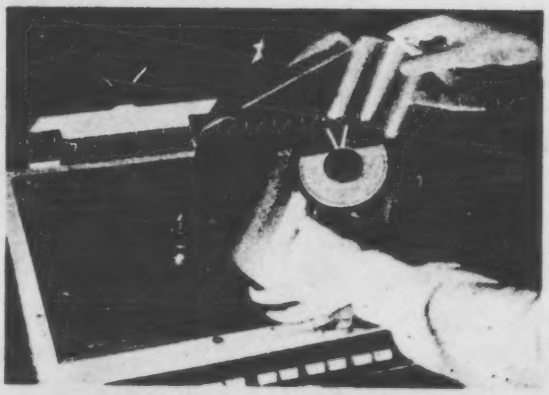
3. Lift the videodisc lid up.



4. Locate the spindle in the center of the videodisc housing. Grasp the lower ring labelled "UNLOCK" and firmly pull straight up.



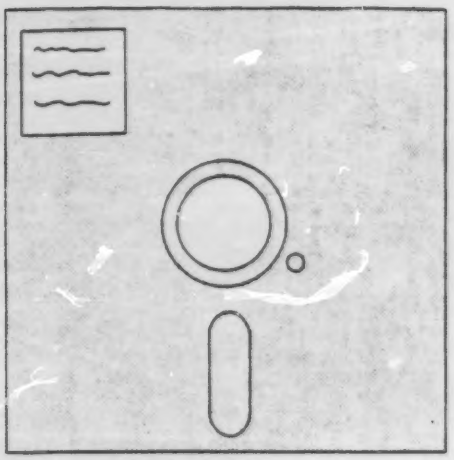
5. Grasp the videodisc preferably by the edges making sure the side you wish to use is facing you.



6. Gently place the videodisc on the player spindle.

7. Using your forefingers, press the ears labelled "LOCK" on the top of the spindle. Failure to lock the videodisc down will result in a loud rumbling noise and no picture in the play mode. You may now close the player's lid.

Using Floppy Diskettes



This is a floppy diskette. The diskette is a magnetic medium on which information is stored. You will be using two different types of floppy diskettes. They are:

(1) PACKAGE CONTROL DISKETTES
(2) STUDENT DATA DISKETTES

There is no physical difference between these diskettes other than their labels. The difference between the two types of diskettes is in the information stored on them and the way in which they are used. The PACKAGE CONTROL DISKETTE contains the information necessary for the microcomputer/videodisc system to present the instructional program. The STUDENT DATA DISKETTE is used to store information on a student's progress.

These diskettes are much more fragile than the videodisc. If you think of PACKAGE CONTROL diskettes as a major part of the instructional package and STUDENT DATA diskettes as the data storage unit for each student, you'll realize how important it is to safeguard them. The important things to remember in caring for your floppy diskettes are:

1. Handle diskettes gently. Although the diskettes are flexible, bending them can cause damage.

2. Diskette covers are specially treated to clean and lubricate diskettes. Keep diskettes in their covers when not in use. Chalk dust is a major enemy to diskettes in the classroom.

3. Do not let anything touch the diskettes on the brown or gray surface. Handle diskettes by the plastic cover only.

4. Do not place diskettes on greasy or dirty surfaces.

5. To write on a diskette, use a felt tip pen only and do not press down hard.

6. Keep diskettes away from magnetic field.

7. Keep diskettes out of direct sunlight or extremely warm (125° Farenheit) temperatures.

Provision is made in system use to make a "back-up" or extra copy of the STUDENT DATA diskettes. This provides insurance against losing valuable student data. Each "PACKAGE CONTROL" diskette comes with a "back-up" diskette as a spare. Put these "back-up" diskettes in a safe place for future use.

Daily Operation—An Overview

To illustrate the use of the IVSET system in the classroom, the following is a step-by-step procedure for getting a student working with the system.

Let's say you have already chosen the DIRECTIONAL PREPOSITIONS package. This package contains a two-sided videodisc, a PACKAGE CONTROL DISKETTE, a BACK-UP PACKAGE CONTROL DISKETTE, a FORMATTER UTILITY DISKETTE, and blank floppy diskettes. First, you must prepare a STUDENT DATA DISKETTE for the student. Each student working with the system must have his/her own STUDENT DATA DISKETTE. If you want your student to work on COIN RECOGNITION as well as DIRECTIONAL PREPOSITIONS, progress data from both packages can be stored on the same diskette. In fact, the student can work on three different instructional packages at a time and use only one STUDENT DATA DISKETTE. The procedure for preparing a STUDENT DATA DISKETTE is outlined on page **29**.

Once you have prepared a STUDENT DATA DISKETTE, you are ready to begin working with the student on the system. Care should be taken to make students feel comfortable with the system and package. Introducing and integrating the system in your classroom is discussed thoroughly on page **45**.

Students generally will work 10-15 minutes per day on a package. You may set a standard length of time for the student to work on the system and may manually end a session earlier. Monitoring the length of student's time on the system is covered on page **29**. With some packages, you will need to flip the videodisc over for the student to complete the package. When this happens, the session will end and you will be given instructions for turning the videodisc over and changing floppy diskettes.

At the end of a session, the student will be shown a graph of his/her progress. This graph will quickly show the student's progress. With the press of a key, you may then review (and print a copy if you wish) other student progress reports. The procedure for generating student progress reports is outlined on page **37**. Information on how to interpret the reports is located on page **52**. .

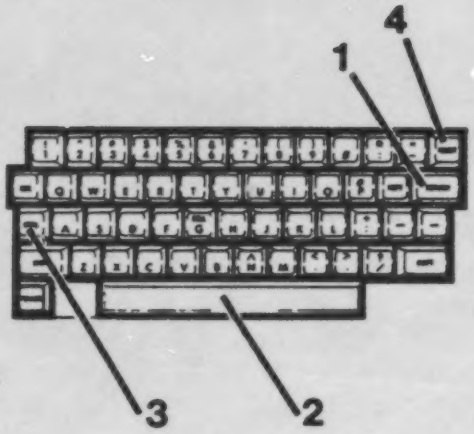
At the end of each day that the system is used, it is advisable to "back-up", i.e., make copies of STUDENT DATA DISKETTES (see page **35**). This assures you that should something happen to the original data diskette, the student's data will still be intact on the extra copy. Backing up diskettes is not vital to system operation. It is simply a type of insurance policy you may wish to use.

Once a week or as the need arises, you may wish to print graphical or summary format reports on each student's progress. Comparison of these periodic print-outs allows you to easily monitor student progress.

Start-up Procedure

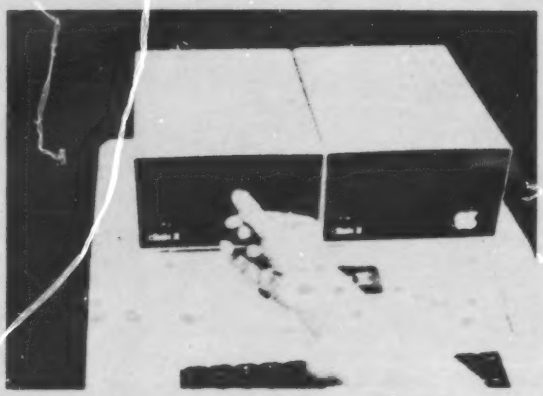
1. At this time, you should become familiar with some of the keys you will be using on the keyboard. They are:

1 - The RETURN Key or (RET)
2 - The Space Bar
3 - The Control Key or (CTRL)
4 - The RESET Key

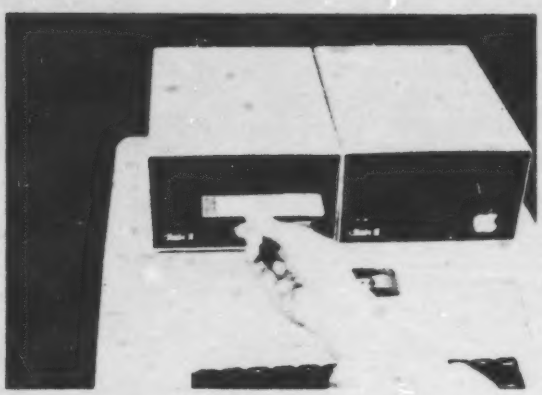


The RETURN key and space bar perform generally the same functions as on a regular electric typewriter. The RESET key allows you to reset the system without turning the power off. The RESET key on most Apple microcomputers has a safety feature which disables the RESET key to prevent accidental resets. To reset the Apple, you must hold down the Control key (CTRL) while you press RESET. Be cautious, however, resetting the system will destroy any data not yet stored on the disk.

2. Locate the diskette labelled PACKAGE CONTROL (name of the program). Using your index finger, lift the door on Disk Drive #1.



3. Gently insert the PACKAGE CONTROL diskette in Drive #1.



4. When the diskette is completely inside Drive #1, lower the drive door.

5. Disk Drive #2 should contain a student data diskette. Each student must be assigned his/her own data diskette. If you are starting the system for the first time, insert one of the blank diskettes labelled STUDENT DATA DISKETTE.

6. Power up the system by turning the outlet bar switch or the Apple's power switch to the on position. The Apple's power switch can be found on the lower rear left-hand side of the Apple.

7. The red "IN USE" lights on the disk drives will appear momentarily while the drive spins. When it stops, the screen will show what is called the MAIN MENU.

The MAIN MENU shows you the name of the package you are using (in this case, Directional Prepositions). The technical name of the program is IVSET IPS and it is Version 5.0. The date and time are also given, however, don't worry if they are wrong. Provision is made to easily change them.

DIRECTIONAL PREPOSITIONS

IVSET IPS.VER.5.00
Date: _____
Time: _____

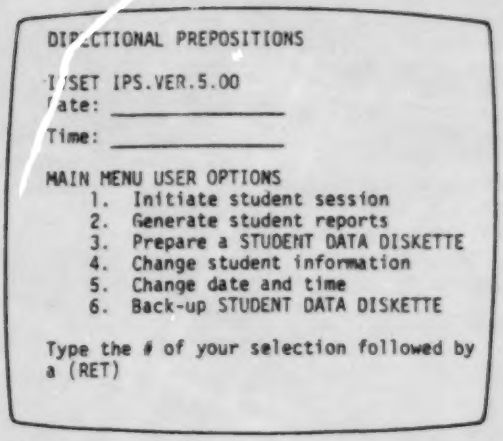
MAIN MENU USER OPTIONS
1. Initiate student session
2. Generate student reports
3. Prepare a STUDENT DATA DISKETTE
4. Change student information
5. Change date and time
6. Back-up STUDENT DATA DISKETTE

Type the # of your selection followed by a (RET)

BEST COPY AVAILABLE

The Main Menu

The MAIN MENU provides several options for the system user. Each option is described in detail in the following sections. The MAIN MENU and each option are designed to be self prompting, i.e., all instructions you should need will be given on the screen. In addition, every attempt has been made to identify possible areas of difficulty and provide error checking. The options are presented on the screen in the order you will most often use them when the system is in full operation. To facilitate your understanding of the system's function, the options will be presented in the order in which they are utilized in system operation. Go over the function of each option and practice using each one.


DIRECTIONAL PREPOSITIONS
I/SET IPS.VER.5.00
Date: _____
Time: _____
MAIN MENU USER OPTIONS
1. Initiate student session
2. Generate student reports
3. Prepare a STUDENT DATA DISKETTE
4. Change student information
5. Change date and time
6. Back-up STUDENT DATA DISKETTE
Type the # of your selection followed by a (RET)

A. Option 5 - Changing Date and Time

The time and date feature is important in recording how often and long the students work with the system. Pressing the 5 key and (RET) will allow you to change the date and time as it appears on the MAIN MENU screen. You will find you generally will need to do this only after the system hasn't been used for a few days, after the weekend, for example.

1. After pressing 5 and (RET) the screen will show . . . . . .

   Enter the date in the form shown and press return.

```
CHANGE DATE AND TIME

ALL INFORMATION MUST BE NUMERIC EXCEPT
WHERE INDICATED.

ENTER THE DATE IN THE FORM
MM-DD-YY (RETURN) WHERE:
     MM REPRESENTS THE MONTH (1-12)
     DD REPRESENTS THE DAY (1-31)
     YY REPRESENTS THE YEAR AND (00-99)
     (RETURN) REPRESENTS THE RETURN KEY

FOR EXAMPLE:
JANUARY 1, 1982 WOULD BE ENTERED AS
01-01-82

ENTER THE DATE HERE ==>■
```

2. The screen will now prompt you to change the time. Enter the time in the form shown and press return.

```
CHANGE THE DATE AND TIME

ALL INFORMATION MUST BE NUMERIC EXCEPT
WHERE INDICATED.

ENTER THE TIME IN THE FORM:
HH:MM:SS XX (RETURN) WHERE:
     HH REPRESENTS THE HOUR (1-12)
     MM REPRESENTS THE MINUTE (00-59)
     SS REPRESENTS THE SECOND (00-59)
     XX IS AM OR PM
     (RETURN) REPRESENTS THE RETURN KEY

FOR EXAMPLE:
1:15PM WOULD BE AS 01:15:00PM

ENTER THE TIME HERE ==>■
```

3. The program will now jump you back to the MAIN MENU. Check the time and date to be sure it is correct. If you wish to change it again, press the 5 key and (RET) and repeat the procedure.

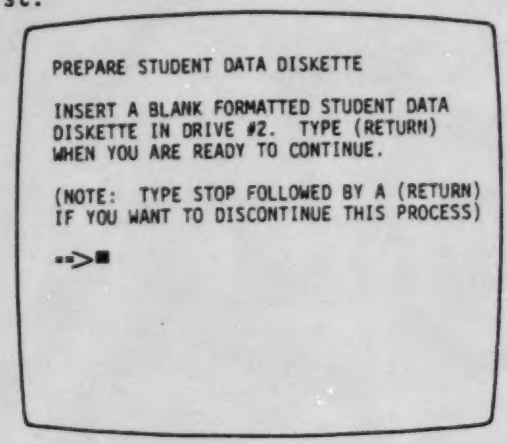
```
DIRECTIONAL PREPOSITIONS

IVSET IPS VERSION 6.11
DATE: _____
TIME: _____

MAIN MENU USER OPTIONS
     1. INITIATE STUDENT SESSION
     2. GENERATE STUDENT REPORTS
     3. PREPARE A STUDENT DATA DISKETTE
     4. CHANGE STUDENT INFORMATION
     5. CHANGE DATE AND TIME
     6. BACKUP STUDENT DATA DISKETTE

TYPE THE # OF YOUR SELECTION FOLLOWED
BY A (RETURN)■
```

* REMEMBER: Anytime you see the ==>■ you may type STOP (RET) to return to the MAIN MENU without completing the procedure.

B. Option 3 - Preparing a New Student Data Diskette

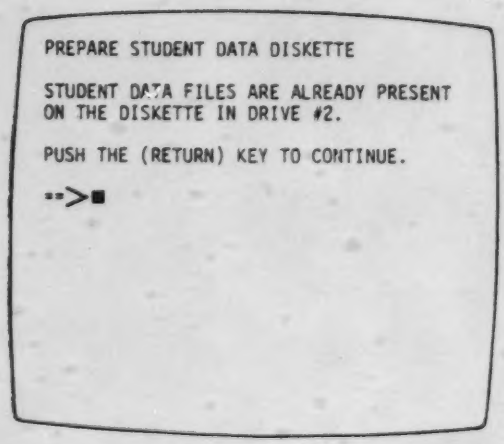
This option is a necessary prerequisite to a student's working on the system. Each student working through one or more IVSET package(s) must have a STUDENT DATA DISKETTE prepared. Preparing a STUDENT DATA DISKETTE consists of "writing" information specific to the student on an already formatted diskette. This diskette will serve as the complete data record of the student's progress. Progress data from up to and including 3 packages at a time may be kept on this diskette. If your diskettes have already been formatted, proceed with this option. If, however, your diskettes are blank, complete the section on FORMATTING THE DISKETTE first.

1. After pressing 3 and (RET), the screen will show . . . . . .


PREPARE STUDENT DATA DISKETTE
INSERT A BLANK FORMATTED STUDENT DATA DISKETTE IN DRIVE #2. TYPE (RETURN) WHEN YOU ARE READY TO CONTINUE.
(NOTE: TYPE STOP FOLLOWED BY A (RETURN) IF YOU WANT TO DISCONTINUE THIS PROCESS)
-->■

2. If you do not have a diskette in Drive #2, the system will prompt you to insert one.

If you have a diskette that already contains data files in drive #2, you will be prompted.


PREPARE STUDENT DATA DISKETTE
STUDENT DATA FILES ARE ALREADY PRESENT ON THE DISKETTE IN DRIVE #2.
PUSH THE (RETURN) KEY TO CONTINUE.
-->■

3. Once the system has determined you wish to prepare the diskette in Drive #2, you will see . . . . . .

```
PREPARE STUDENT DATA DISKETTE

  STUDENT NAME(                          )
STUDENT NUMBER(     )
TIMED SESSIONS(     ) (Y OR N)
SESSION LENGTH(     ) DEFAULT 15 MIN.
      COMMENTS(                        )
              (                        )
              (                        )
         ENTER(   )
CURSOR MOVEMENT COMMANDS:
RETURN-- NEXT LINE OR TOP OF FORMAT
ARROWS-- ONE CHARACTER LEFT OR RIGHT
DATA ENTRY COMMANDS:
ESC-- END & ACCEPT DATA (RECOGNIZED ONLY
IN "ENTER" FIELD)
CTRL-Q-- ABORT ENTRY (DATA IGNORED)
```

The area between the brackets is available for you to insert information. You may now begin entering student information. NOTE: If when you begin to type, a bell sounds and no characters appear on the screen, hold down the CTRL key with one finger while hitting the A key. You should be able to type without any problem now. Each category of student information is described below:

STUDENT NAME

STUDENT NUMBER - You may assign student numbers arbitrarily. Be sure, however, that you maintain a log of all student names and corresponding numbers. Student numbers help prevent accidently mixing up STUDENT DATA DISKETTES of students with the same name as well as saving you time in initiating a student session.

TIMED SESSIONS - This feature allows you to set up an instructional session length for each individual student. If you want the system to automatically shut off after a student session, type Y. If you prefer to shut the system down manually each session, type N. NOTE: You may end a session earlier than designated, by typing E at the keyboard.

SESSION LENGTH - If you responded N to TIMED SESSIONS, do not fill in this space. If you responded Y to TIMED SESSIONS, enter the number of minutes you want the instructional session to last.

COMMENTS - This space is reserved for you as a "scratch pad" to make student notations.

When you are finished entering information, position the cursor in the space marked ENTER (■) and press the ESC key (see page 25). The disk drive will spin for about 40 seconds. When it stops, your diskette is ready for student use.

C. Option 4 - Changing Student Information

The "Changing Student Information" option allows you to access information you have already placed on a STUDENT DATA DISKETTE. Using this feature you may update student information on any existing STUDENT DATA DISKETTE.

1. Upon typing 4 and (RET), you will be shown . . . . . .

   Spaces will be filled in with the student information already placed on the diskette. You may change this information in the same manner in which it was entered (see page 30).

```
CHANGE STUDENT INFORMATION

INSERT STUDENT DATA DISKETTE IN DRIVE
#2.  TYPE (RETURN) WHEN YOU ARE READY
TO CONTINUE.

(NOTE:  TYPE STOP AND A (RETURN) IF YOU
WANT TO DISCONTINUE THIS PROCESS)

-->■
```

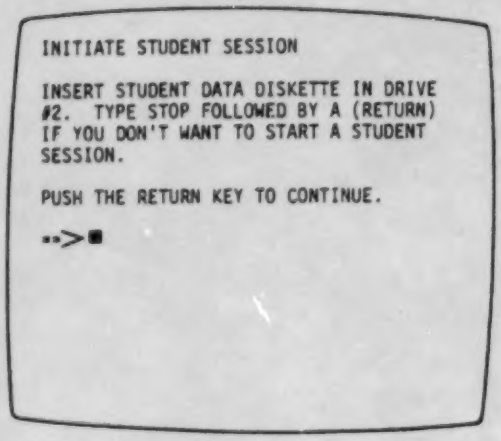
2. When you are finished, press (RET). The disk drives will whirr and spin momentarily. When they are finished, you will be returned to the MAIN MENU.

```
DIRECTIONAL PREPOSITIONS

IVSET IPS VERSION 6.10
DATE: _____________
TIME: _____________

MAIN MENU USER OPTIONS
     1.  INITIATE STUDENT SESSION
     2.  GENERATE STUDENT REPORTS
     3.  PREPARE A STUDENT DATA DISKETTE
     4.  CHANGE STUDENT INFORMATION
     5.  CHANGE DATE AND TIME
     6.  BACKUP STUDENT DATA DISKETTE

TYPE THE # OF YOUR SELECTION FOLLOWED
BY A (RETURN)■
```

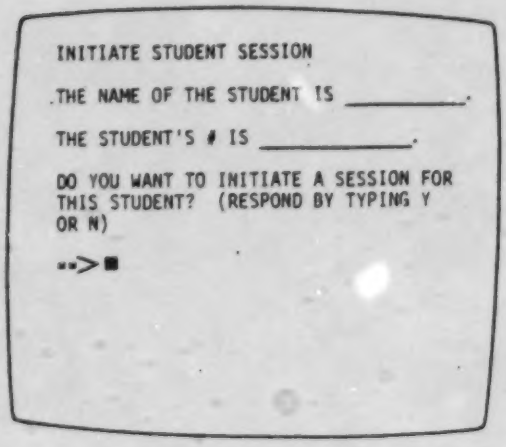
D. Option 1 - Initiating a Student Session

The "Initiate a Student Session" option is the option used to actually start the program. At this time, you would have a STUDENT DATA DISKETTE in Drive #2.

1. After pushing 1 and (RET), if you have prepared the STUDENT DATA DISKETTE, the screen will display . . .

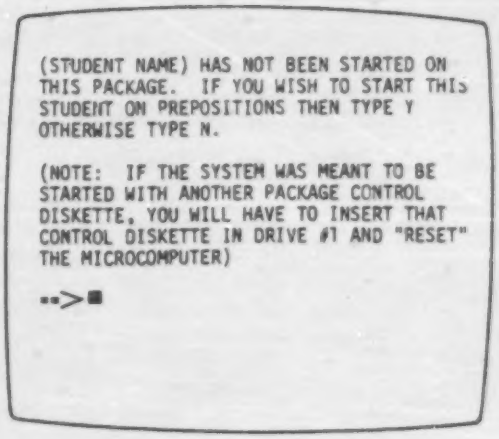

INITIATE STUDENT SESSION
INSERT STUDENT DATA DISKETTE IN DRIVE #2. TYPE STOP FOLLOWED BY A (RETURN) IF YOU DON'T WANT TO START A STUDENT SESSION.
PUSH THE RETURN KEY TO CONTINUE.
-->■

2. If you haven't already, insert the STUDENT DATA DISKETTE for the next student in Drive #2. Press return and the screen will display . . . . . .

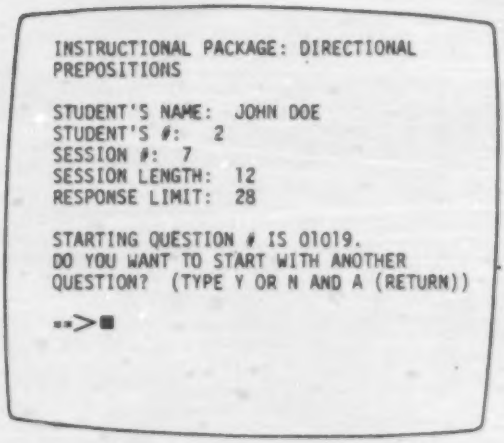

INITIATE STUDENT SESSION
THE NAME OF THE STUDENT IS _____.
THE STUDENT'S # IS _____.
DO YOU WANT TO INITIATE A SESSION FOR THIS STUDENT? (RESPOND BY TYPING Y OR N)
-->■

To start a session for a different student, type NO and (RET). To start a session for the student whose name appears on the screen, type YES and (RET).

NOTE: If Drive #2 does not hold a prepared STUDENT DATA DISKETTE, you will be told and prompted to insert a STUDENT DATA DISKETTE. If a student has not begun working with the package, the screen will display . . . . . .

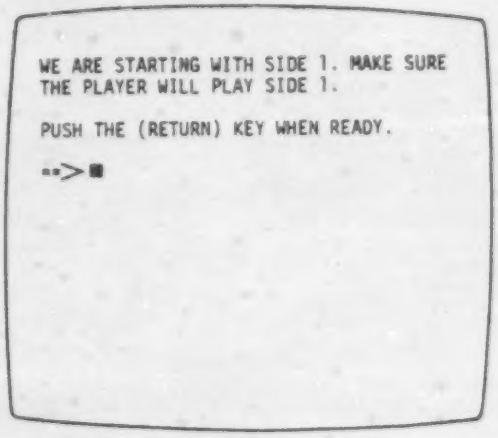

(STUDENT NAME) HAS NOT BEEN STARTED ON THIS PACKAGE. IF YOU WISH TO START THIS STUDENT ON PREPOSITIONS THEN TYPE Y OTHERWISE TYPE N.
(NOTE: IF THE SYSTEM WAS MEANT TO BE STARTED WITH ANOTHER PACKAGE CONTROL DISKETTE, YOU WILL HAVE TO INSERT THAT CONTROL DISKETTE IN DRIVE #1 AND "RESET" THE MICROCOMPUTER)
-->■

3. After the system is sure you have a working STUDENT DATA DISKETTE in Drive #2, the screen will display . . . . . .


INSTRUCTIONAL PACKAGE: DIRECTIONAL PREPOSITIONS
STUDENT'S NAME: JOHN DOE
STUDENT'S #: 2
SESSION #: 7
SESSION LENGTH: 12
RESPONSE LIMIT: 28
STARTING QUESTION # IS 01019.
DO YOU WANT TO START WITH ANOTHER QUESTION? (TYPE Y OR N AND A (RETURN))
-->■

This is all information stored on the STUDENT DATA DISKETTE when it was prepared (see pages **29 - 31**). The starting question # is the point at which the student should be in this session based on his/her performance in the last session. To begin where the student left off, type N and return.

4. The system will now tell you which side of the videodisc should be facing up toward you in the player. This is an extra safeguard to keep you from playing the wrong side of a two sided videodisc. Press the (RET) key when ready. The videodisc should begin spinning and within 10 seconds the instructional session will begin.

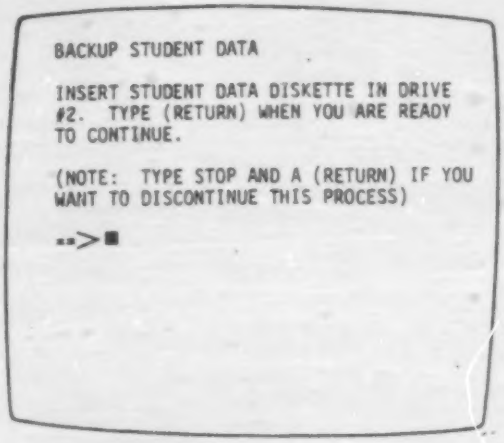


E. Option 6 - Backing Up Student Data Diskettes

"Backing-up" STUDENT DATA DISKETTES refers to making a duplicate copy (back-up) of a diskette in case something happens to the original. Even with proper care, diskettes may become damaged. If all of a student's data are on one diskette and it should somehow become unusable, valuable information is forever lost. Back-up diskettes are simply a form of insurance, something like making a photostatic copy of an important document. It is recommended you "back-up" STUDENT DATA DISKETTES at the end of each day.

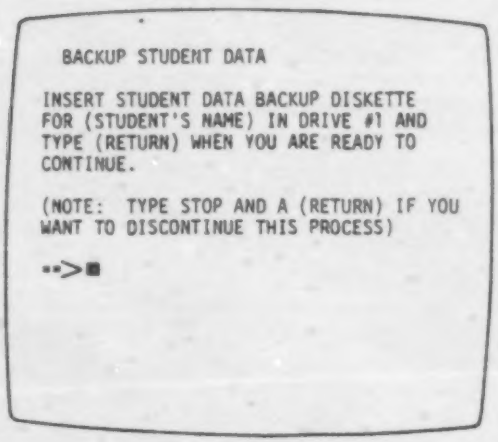
1. After typing 6 and (RET), the screen will display . . . . . .

   Insert the STUDENT DATA DISKETTE you want to back-up in Drive #2 and press return.

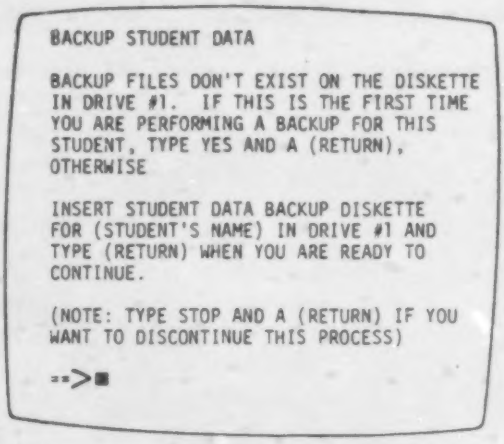

BACKUP STUDENT DATA
INSERT STUDENT DATA DISKETTE IN DRIVE #2. TYPE (RETURN) WHEN YOU ARE READY TO CONTINUE.
(NOTE: TYPE STOP AND A (RETURN) IF YOU WANT TO DISCONTINUE THIS PROCESS)
-->■

2. When the drives finish chattering and spinning, you will see this display . . . . . .

   Remove the PACKAGE CONTROL DISKETTE from Drive #1 now, insert the BACK-UP STUDENT DATA DISKETTE in Drive #1 and press (RET).


BACKUP STUDENT DATA
INSERT STUDENT DATA BACKUP DISKETTE FOR (STUDENT'S NAME) IN DRIVE #1 AND TYPE (RETURN) WHEN YOU ARE READY TO CONTINUE.
(NOTE: TYPE STOP AND A (RETURN) IF YOU WANT TO DISCONTINUE THIS PROCESS)
-->■

3. If this is the first time you've used the back-up diskette, the screen will display . . . . . .


BACKUP STUDENT DATA
BACKUP FILES DON'T EXIST ON THE DISKETTE IN DRIVE #1. IF THIS IS THE FIRST TIME YOU ARE PERFORMING A BACKUP FOR THIS STUDENT, TYPE YES AND A (RETURN), OTHERWISE
INSERT STUDENT DATA BACKUP DISKETTE FOR (STUDENT'S NAME) IN DRIVE #1 AND TYPE (RETURN) WHEN YOU ARE READY TO CONTINUE.
(NOTE: TYPE STOP AND A (RETURN) IF YOU WANT TO DISCONTINUE THIS PROCESS)
-->■

4. The drives will spin for about 1 minute while the original STUDENT DATA DISKETTE is being copied onto the BACK-UP STUDENT DATA DISKETTE. When the back-up process is complete, you will be branched back to the display for step #1 to back-up your next STUDENT DATA DISKETTE. To return to the MAIN MENU, type STOP and (RET).

F. Option 2 - Generating Student Progress Reports

The "Generating Student Reports" option allows you to retrieve student data in several different report formats. The reports may be generated in a graphical format as well as a summary format. In addition, you may opt to a listing of each student's response during a session. The report formats are shown below.

STUDENT PROGRESS GRAPH

STUDENT SUMMARY REPORT

JENNIFER prepositions

Date	Sess	Length sess	Start ques	End ques	Total# given	Total# correct	Total% correct	Total# no-resp	Total# Touch sig
1/13/82	1	7	01019	02190	26	19	73	0	0
1/13/82	2	8	02190	02010	34	28	82	0	0
1/13/82	3	5	02010	03160	17	15	88	0	0
1/13/82	4	7	03160	04180	25	18	72	0	0
1/13/82	5	8	04180	05010	34	28	78	0	0

STUDENT INFORMATION REPORT

Student name JENNIFER
Student number: 8

Sessions are timed
Session length: 15

Data file are set up for the following packages: prepositions

Data files for this student were prepared on 1/13/82

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STUDENT SESSION INFORMATION REPORT

Student name: JENNIFER
Student number: 8

Student is initialized for the following packages:
1-prerequisites
2-
3-

1	1	1/13/82	01010	02190	02190	02190	7	0	0	24	19	7	0
1	2	1/13/82	02190	02010	02010	02010	8	0	0	34	28	6	0
1	3	1/13/82	02010	03160	03160	03160	5	0	0	17	15	2	0
1	4	1/13/82	03160	04180	04180	04180	7	0	0	25	18	7	0
1	5	1/13/82	04180	05010	05010	05010	8	0	0	34	28	8	0

STUDENT RESPONSE INFORMATION REPORT

Student name JENNIFER
Student number: 8

Instructional Package: prerequisites

1	1	02010	0	5	1	2	02211	0	5
1	1	02020	0	35	1	2	02220	0	48
1	1	02030	0	20	1	2	02230	1	16
1	1	02040	0	4	1	2	02231	0	14
1	1	02050	1	25	1	2	02240	0	28
1	1	02051	0	17	1	2	02250	0	11
1	1	02060	1	25	1	2	02260	0	8
1	1	02061	0	9	1	2	02270	1	3
1	1	02070	0	23	1	2	02271	0	9
1	1	02080	1	47	1	2	02280	0	11
1	1	02081	0	1	1	2	02290	0	8
1	1	02090	0	24	1	2	02300	0	25
1	1	02100	0	23	1	2	02310	0	10
1	1	02110	1	3	1	2	02320	1	10
1	1	02111	0	4	1	2	02321	0	15
1	1	02120	0	15	1	2	02330	0	7
1	1	02130	1	13	1	2	02340	0	13
1	1	02131	1	5	1	2	02350	0	3
1	1	02131	0	3	1	2	02360	0	10
1	1	02140	0	14	1	2	02370	0	4
1	1	02150	0	12	1	2	02380	0	8
1	1	02160	0	11	1	2	02390	1	5
1	1	02170	1	3	1	2	02391	0	13
1	1	02171	0	9	1	2	02400	0	13
1	1	02180	0	16	1	2	02419	0	8
1	1	02190	0	38					
1	2	02191	0	32					
1	2	02200	0	84					
1	2	02210	1	11					

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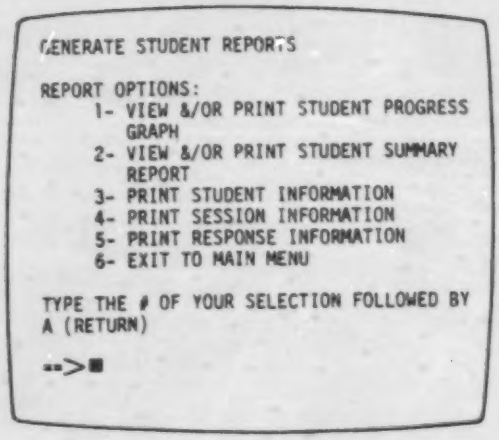
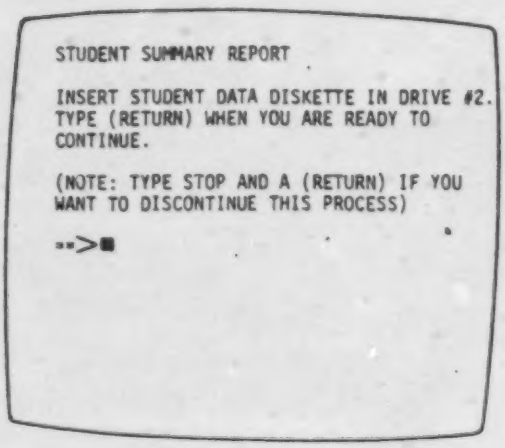
1. After typing 2 and (RET), the screen will show . . . . . .

   Because each option goes through almost the same sequence of steps, we will lead you through Option 2 - "Review and/or Print Student Summary Report" only.


GENERATE STUDENT REPORTS
REPORT OPTIONS:
1- VIEW &/OR PRINT STUDENT PROGRESS GRAPH
2- VIEW &/OR PRINT STUDENT SUMMARY REPORT
3- PRINT STUDENT INFORMATION
4- PRINT SESSION INFORMATION
5- PRINT RESPONSE INFORMATION
6- EXIT TO MAIN MENU
TYPE THE # OF YOUR SELECTION FOLLOWED BY A (RETURN)
-->■

2. After selecting Option 2 and pressing (RET), the screen will show . . . . . .


STUDENT SUMMARY REPORT
INSERT STUDENT DATA DISKETTE IN DRIVE #2. TYPE (RETURN) WHEN YOU ARE READY TO CONTINUE.
(NOTE: TYPE STOP AND A (RETURN) IF YOU WANT TO DISCONTINUE THIS PROCESS)
-->■

3. Be sure the printer is turned on and loaded with paper if you are making a printout. Insert the appropriate STUDENT DATA DISKETTE (if you haven't already) and press (RET). The report will appear on the screen. At the bottom of the report, you will be prompted "Do you want to make a printout of this?" (Y/N)

   Type Y and (RET) for a printout. To return to step #2, press N and (RET).

Formatting the Student Data Diskettes

If your diskettes are new and have not been used to collect student data, they probably will need to be formatted before being prepared for student data collection. To format your diskettes, use the following procedure. NOTE: Each time you format a diskette, you are erasing any information already stored on it. Be careful not to format a diskette with important information on it.

1. Insert the diskette labelled FORMATTER UTILITY in Drive #1. Turn the Apple on or press RESET while holding down the CTRL (Control) key. The screen display will look like this.....

```
IVSET DISK FORMATTER PROGRAM

USER OPTIONS:
     1- FORMAT FOR STUDENT DATA USE
     2- FORMAT FOR STUDENT DATA BACKUP USE
     3- TERMINATE PROGRAM

TYPE THE NUMBER OF YOUR CHOICE AND PUSH
THE RETURN KEY.

-->■
```

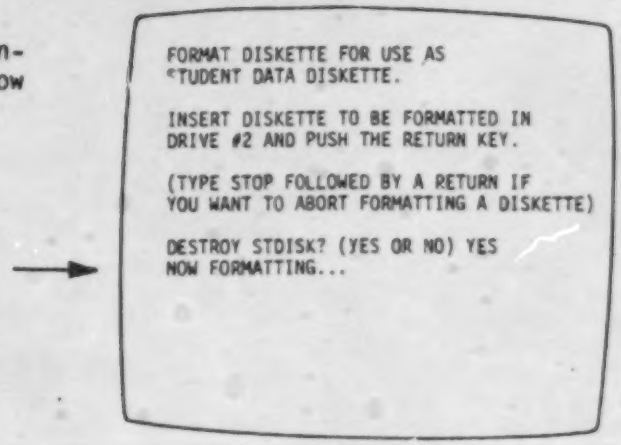
2. To format a diskette on which to collect student data every session, press 1 and the RETURN key. The screen will display (To format a diskette for student data back-up use, see steps 6-9).

```
FORMAT DISKETTE FOR USE AS
STUDENT DATA DISKETTE.

INSERT DISKETTE TO BE FORMATTED IN
DRIVE #2 AND PUSH THE RETURN KEY.

(TYPE STOP FOLLOWED BY A RETURN IF
YOU WANT TO ABORT FORMATTING A DISKETTE)

-->■
```

3. Insert the diskette you want to format in Drive #2 and press the RETURN key. If there is anything already on your diskette, the screen will show the name of the diskette and ask if you want to destroy it. Remember, any information on the diskette in Drive #2 will be destroyed in the formatting process, so check once and type YES and the RETURN key to go on. →

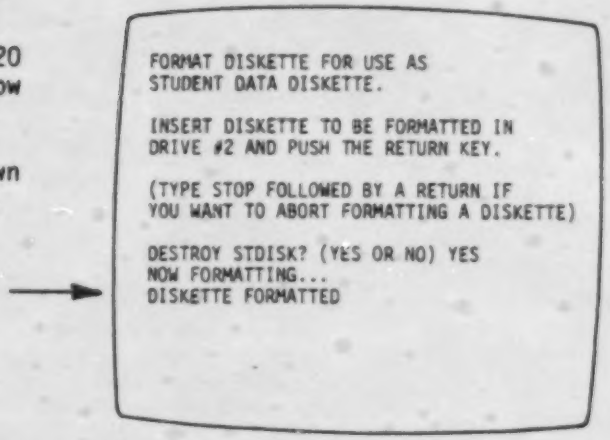
```
FORMAT DISKETTE FOR USE AS
STUDENT DATA DISKETTE.

INSERT DISKETTE TO BE FORMATTED IN
DRIVE #2 AND PUSH THE RETURN KEY.

(TYPE STOP FOLLOWED BY A RETURN IF
YOU WANT TO ABORT FORMATTING A DISKETTE)

DESTROY STDISK? (YES OR NO)■
```

4. The disk drive will begin spinning and the screen will show

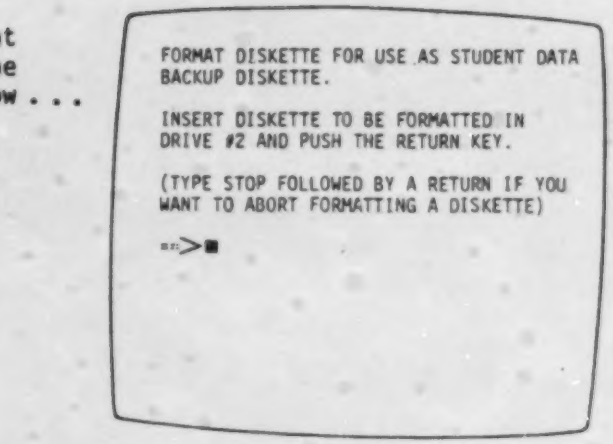

FORMAT DISKETTE FOR USE AS
STUDENT DATA DISKETTE.
INSERT DISKETTE TO BE FORMATTED IN
DRIVE #2 AND PUSH THE RETURN KEY.
(TYPE STOP FOLLOWED BY A RETURN IF
YOU WANT TO ABORT FORMATTING A DISKETTE)
DESTROY STDISK? (YES OR NO) YES
NOW FORMATTING...

5. The drive will spin for about 20 seconds and the screen will show this display

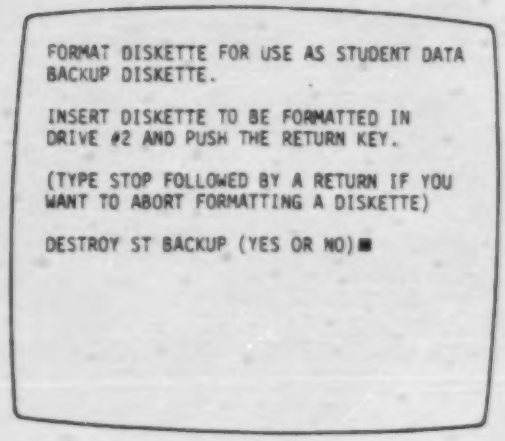
   and return to the display shown in step 1.


FORMAT DISKETTE FOR USE AS
STUDENT DATA DISKETTE.
INSERT DISKETTE TO BE FORMATTED IN
DRIVE #2 AND PUSH THE RETURN KEY.
(TYPE STOP FOLLOWED BY A RETURN IF
YOU WANT TO ABORT FORMATTING A DISKETTE)
DESTROY STDISK? (YES OR NO) YES
NOW FORMATTING...
DISKETTE FORMATTED

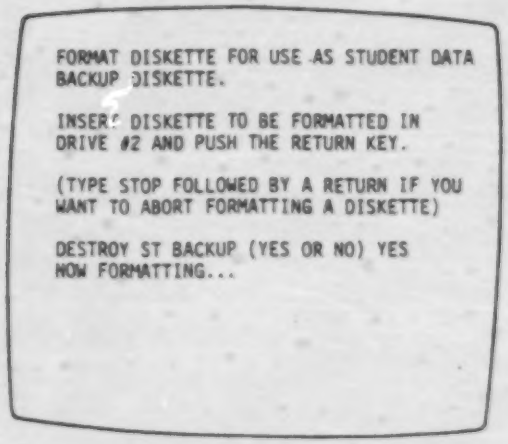
6. To format a diskette for student data backup use, press 2 and the RETURN key. The screen will show . . .


FORMAT DISKETTE FOR USE AS STUDENT DATA
BACKUP DISKETTE.
INSERT DISKETTE TO BE FORMATTED IN
DRIVE #2 AND PUSH THE RETURN KEY.
(TYPE STOP FOLLOWED BY A RETURN IF YOU
WANT TO ABORT FORMATTING A DISKETTE)
=:>■

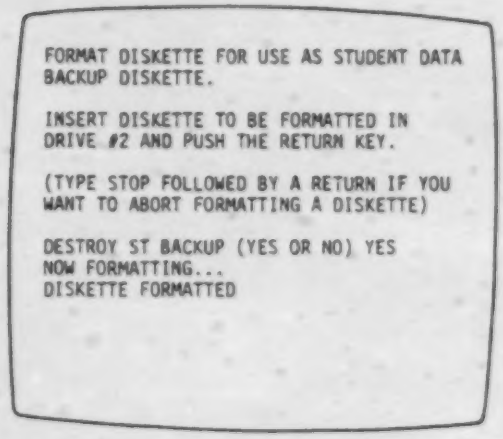
7. Insert the diskette you want to format in Drive #2 and press the RETURN key. If any information is already on your diskette, the screen will show the name of the diskette and ask if you want to destroy it. Type Yes and press RETURN to continue.


FORMAT DISKETTE FOR USE AS STUDENT DATA BACKUP DISKETTE.
INSERT DISKETTE TO BE FORMATTED IN DRIVE #2 AND PUSH THE RETURN KEY.
(TYPE STOP FOLLOWED BY A RETURN IF YOU WANT TO ABORT FORMATTING A DISKETTE)
DESTROY ST BACKUP (YES OR NO)■

8. The disk drive will begin to spin and the screen will show . . . . . .


FORMAT DISKETTE FOR USE AS STUDENT DATA BACKUP DISKETTE.
INSERT DISKETTE TO BE FORMATTED IN DRIVE #2 AND PUSH THE RETURN KEY.
(TYPE STOP FOLLOWED BY A RETURN IF YOU WANT TO ABORT FORMATTING A DISKETTE)
DESTROY ST BACKUP (YES OR NO) YES
NOW FORMATTING...

9. The drive will spin for about 20 seconds and the screen will show this display and return to the screen shown in step 1.


FORMAT DISKETTE FOR USE AS STUDENT DATA BACKUP DISKETTE.
INSERT DISKETTE TO BE FORMATTED IN DRIVE #2 AND PUSH THE RETURN KEY.
(TYPE STOP FOLLOWED BY A RETURN IF YOU WANT TO ABORT FORMATTING A DISKETTE)
DESTROY ST BACKUP (YES OR NO) YES
NOW FORMATTING...
DISKETTE FORMATTED

Exiting from the System

Several provisions have been made for exiting from the system. Students will be automatically exited from an instructional session if session length was set when the STUDENT DATA DISKETTE was prepared. The session can be manually ended before the predefined time is over by pressing the E key. After the E is pressed, the videodisc will finish presenting the current question and the end of session message and graphic will be initiated.

To exit from the system in an instructional session, look for the cursor prompt. It looks like this ==>■. Anytime you are presented with this prompt, you may type in STOP and press return to exit the procedure. Generally, you will be returned to the MAIN MENU, however you may need to repeat STOP (RET) if you are in another menu, "Generating Student Reports" for example. Anytime the MAIN MENU is displayed on the screen, you may shut off the power without chancing destroying student data.

Teaching Students to Work with the System

Teaching Students to Work with the System

Teaching your students how to use the videodisc system can be accomplished on an individual or group basis. It is important to spend as much time as possible with the new videodisc user so his/her first contact with this new learning tool will be a rewarding experience. Although initially requiring more of your time this will help insure the student a successful learning experience for the student and minimize unnecessary frustration in the long run. After the learner is comfortable and proficient with using the videodisc, teacher contact will be reduced to occasional 'spot checks' to catch and clear up any questions or small problems that may arise.

To make the first few days of system use as smooth as possible, be prepared to go over the following with your students.

PROPER SEATING - Emphasize to students the importance of sitting with both feet on the floor and looking directly at the television screen. Viewing the screen from any other angle but straight on will cause distortion in the student's perspective. Consequently, the student may touch what looks like the right answer, but really is a wrong response.

TOUCHING THE SCREEN - Proper screen touching is essential to a student's success with the system. Show students the pointer and demonstrate the correct pointing procedures outlined below.

CORRECT POINTING PROCEDURES

(1) Hold pointer in left or right hand as you would a pencil.

(2) Rest arms on table in front of television monitor.

(3) When system gives a command, i.e., "Touch the dime" lift your arm keeping your elbow on table.

(4) Line the pointer up with the place on the screen you wish to touch.

(5) Slowly move the pointer directly toward the screen until contact is made with the glass on the television screen. A beep should be heard. If you do not hear a beep, pull the pointer away from the screen and touch the screen again. TEACHER'S NOTE: If this should fail, press the red reset button on the touch panel control box and touch the screen again.

Caution students only to touch the screen after the videodisc has stopped and is waiting for an answer. Also have students keep hands and other objects such as pencils out of the touch panel area. When the touch panel recognizes a response, a beep will be heard from the Apple. You may want to tell students "This is the machine's way of saying O.K., I hear you." Tell students, if they don't hear the beep to remove the pointer and touch again. If this fails, they should signal for you (see page 51).

PAYING CLOSE ATTENTION - Stress the need for students to pay close attention to the screen. The system presents instruction, waits for a response, gives feedback and searches for the next segment. During the searches, your students may be momentarily distracted. Unlike a human, the machine doesn't wait for the student to attend to it. As soon as the videodisc has found the next segment, it will begin to play. If the student is looking the other direction or not listening, he/she may miss the next instruction.

ENDING A SESSION - The system is designed to end the student's instructional session after a certain number of minutes you predetermine when you prepare the STUDENT DATA DISKETTE. You may, however, end a student's session at any time by pressing the E key (see page 43). When the student's alloted time is up, the system will display a graphical representation of the student's progress during the session. Instruct your students beforehand in what you want them to do at the end of their session. Generally, you will want them to return to their other work. However, the first few sessions you may want to go over their progress and discuss system problems with them (see page 52).

Integrating the IVSET System in Your Classroom

Some Questions and Answers

Integrating the IVSET System in your Classroom— Some Questions and Answers

This section is arranged in a question/answer format to provide potentially helpful information for the novice system user.

(1) HOW SHOULD I INTRODUCE THE SYSTEM TO MY STUDENTS?

Students should originally be introduced to the system in small groups. All students who will be in the classroom during videodisc use should be shown the system before instructional use begins. This will dampen curiousity and facilitate system integration into the classroom. Emphasize that the videodisc is not a toy. Help your students understand that the machine can make mistakes and that they should not feel too frustrated when it happens. The student should be encouraged to handle small difficulties on their own and report any major system problems to you.

It is also important to define ways in which students using the system can get your attention in a patient and non-disruptive way. One effective technique is to instruct the student to raise his/her hand when in need of assistance until eye contact with you is established. You can then nod in acknowledgement of the student's hand. This will signal the student to lower his/her hand and wait patiently for you to come over. Whatever technique you choose, it should be one which is minimally disruptive to you and the other students in the class.

(2) WHERE SHOULD I PUT THE SYSTEM?

Set the videodisc system up wherever it will be the least disruptive to the classroom as a whole. Preferably, this would be in an area where the student using the system would not likely be disturbed or distracted. Setting the system up in a corner facing the wall with a partition separating it from the rest of the room is an optimal classroom situation.

In addition, use a chair with the system that allows the student to look directly at the television screen. This becomes very important when the student is required to touch the screen. Improper seating can distort the student's perspective causing him/her to make what seemed like a correct answer, but really were incorrect coordinates (see page 46).

(3) WHEN AND FOR HOW LONG SHOULD MY STUDENTS WORK ON THE SYSTEM?

The length of student's daily session will vary based on the individual student's attention span. Student sessions should last approximately 15 minutes, but should not exceed 20 minutes. The automatic shut off on the videodisc will allow you to decide how long you want each student's session to be (see page 29).

It is important the students know that using the videodisc is part of their regular daily routine. Set up a schedule for each student and try to keep scheduled times as consistent as possible.

(4) HOW MUCH TIME SHOULD I SPEND WITH STUDENTS WORKING WITH THE SYSTEM?

Initially, you will need to invest some time in teaching students to use the system (see page 46). Once students are confident in using the system, you will be involved in:

A. Praise

B. Correction

C. Teacher Signals

A. Praise

Instructional packages available for the MCVD System all contain immediate feedback and variable positive reinforcement depending on the package used. This is generally sufficient feedback for students while they are working on the system. The feedback and reinforcement in the packages is not however, a replacement for your praise. Following each his/her session, praise the student for working with the system. A graphic screen display will appear showing the student's overall progress as well as session progress. Go over this with the student in an encouraging manner especially when you believe the student may be experiencing some difficulty with the package.

Do not be misled into believing that the reinforcement supplied by the system replaces other reinforcement schedules. Problems can arise when reinforcement systems generally used in the classroom are not employed with videodisc use. For example, if you award students tokens or time on a computer for mastering objectives, make the same arrangements for videodisc users. Do not let users feel they are being slighted in regular classroom activities.

B. Correction

The MCVD instructional packages are designed to provide correction while the student is on the system. If, however, the student exhibits off-task behavior during his/her session, employ the same approach you would use with any off task behavior.

C. Teacher Signals

If the student is experiencing difficulty with a particular item, you may have to provide additional help. You will be signalled to come to the system by a continual beeping sound from the Apple. When you reach the system, press the "G" key. This will cause the package to repeat the item that is causing the problem. More information on "teacher signals" can be found in the appended information on individual packages.

(5) HOW DO I KNOW HOW WELL EACH STUDENT IS DOING?

During a student's session, data are collected on his/her performance. At the end of the session, these data are stored on the STUDENT DATA DISKETTE. At the end of each student's session, the screen will display a "thermometer graph" of the student's progress. This graph is meant to provide immediate progress information to the student. It shows the student where he/she is in relationship to the end of the package. By pressing the space bar at this point, the screen will display additional student progress information. Using the printer, you can print out a copy of these reports for later reference or filing. Let the recordkeeping system be your guide. Quick and frequent scans of the student's progress, paired with intermittent observations of the student, will reveal any academic or system related difficulties the student may be having.

System Troubleshooting

System Troubleshooting

NOTHING HAPPENS

Check all power cords for connection to the machine as well as the outlet bar.

Check to see that outlet bar is plugged into wall.

Be sure outlet bar power light is on.

Check all power switches.

Check individual connections.

NO PICTURE

Check to see that the LINE button on the front of the monitor is pushed in.

Check the VIDEO LINE IN on the back of the monitor to be sure it is connected (see page **11**).

Follow the cable from VIDEO LINE IN on the monitor to be sure it's connected to the MON connector on the VMI box (see page **10**).

Follow the cable from the VID connector on the VMI box to the VIDEO OUT on the videodisc (see page **11**).

Be sure the Amphenol Connector on the back of the videodisc player is connected to the pins labelled TO VIDEODISC on the VMI board (see page **7**).

Check to see the videodisc material you wish to use is facing up inside the player (see page **21**).

NOTE: If you wish to use a commercially available videodisc on the player which was produced for the consumer player, it must be put in the player with the material you wish to play on bottom.

NO AUDIO	If you are using audio through the television : Be sure volume on television set is turned up adequately. Check to see that the male mini plug is connected to the back of the monitor in AUDIO LINE IN (see page **14**). Check to see that the other end of this cable, the RCA male mini plug is connected to the back of the videodisc player on CH 2, AUDIO OUT. This cable can be reversed if you try hard enough, but will not work (see page **14**). If you are using audio through the headphones: Be sure Y cable is connected to CH 1 audio out on the videodisc player. Check connections to the headphones.
LOUD RUMBLING NOISE WHEN THE VIDEODISC BEGINS TO PLAY	The videodisc is not locked down on the spindle (see page **21**).
THE VIDEODISC WILL NOT SPIN	Check power and power cords first. Then be sure the screw holding the videodisc "turntable" has been released (see page **3**).
DISK DRIVE(S) WILL NOT STOP SPINNING	1) Push RESET while holding down the CTRL button. 2) Be sure you have diskettes in the drive. 3) Be sure the diskette is one that has been already formatted. 4) If drive will still not stop spinning, replace the diskette.

DISK DRIVE(S) WILL NOT SPIN	1) Be sure Apple is plugged in and the power is on. 2) Turn off Apple power and check to see that the interface card is sitting squarely in slot 3 (see page 9). 3) Check to see that the disk drives are properly attached to the disk drive interface card. 4) If you heard a loud pop when you turned the Apple power on you have probably mismatched the pins on the interface card. Serious damage has probably been done to your disk drive(s). See an authorized service person.
VIDEODISC PRESENTS INSTRUCTION, BUT DOESN'T ACCEPT INPUT FROM THE TOUCH SCREEN	Check to see that touch panel control box is plugged in, turned on, ribbon colored cable is plugged into the box, baud select is on #2 (see page 12) and be sure the 25 pin connector is plugged into the LINE connection. The other end of the cable should be connected to the VMI board in slot #4.
TELEVISION SHOWS SNOW AND MAKES NOISE	Check to see that the LINE button on the front of the monitor is pushed in.
COLOR IS INACCURATE	Adjustments in picture color, brightness and hue can be made on this monitor like any television set.
YOU SELECT AN ALTERNATE STARTING NUMBER AND RECEIVE THE FOLLOWING DISPLAY	
UNABLE TO FIND FROM _____	This means you entered a starting question number that does not exist. Push RESET while holding down CTRL and begin again.

Appendices

APPENDIX A

Timetelling

Timetelling

Program Objectives:

1) The student will be able to look at a clock-face and identify the correct time to five minute intervals.

2) The student will be able to identify the correct time to five minute intervals when represented in a 'digital' format such as "1:25".

Prerequisites:

This program assumes the student can count and read the numbers 0-55 by fives. The student must also be able to discriminate big and little hands on the clock, and either red and green OR the written words yes and no.

Lesson Objectives:

Lesson 1. Given a clock with no hands and some missing numbers, the student will identify the correct number for the appropriate circle on the clock 7 out of 8 times.

Lesson 2. Given a clock with no hands or numbers, the student will identify the correct number for the appropriate circle on the clock 7 out of 8 times.

Lesson 3. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 1-6, for the appropriate circle designated by the little hand 7 out of 8 times.

Lesson 4. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 6-11, for the appropriate circle designated by the little hand 7 out of 8 times.

Lesson 5. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 12 and 1, for the appropriate circle designated by the little hand 7 out of 8 times.

Lesson 6. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 1-12, represented in digital format, designated by the little hand 7 out of 8 times.

Lesson 7. Given a clock with some missing numbers, a little hand, and a big hand, the student will identify the correct number, represented in digital format, designated by the little hand 7 out of 8 times.

Lesson 8. Given a clock with no hands and some numbers around the outside of the clock in intervals of 5, 0-55, the student will identify the correct number for the appropriate square 7 out of 8 times.

Lesson 9. a. Given the numbers in intervals of 5, 0-55, around the outside of the clock, and a big hand, the student will identify the correct number designated by the big hand 3 out of 4 times.

b. Given a clock with numbers 1-12 and a big hand, the student will identify the correct number in digital format, designated by the big hand 7 out of 8 times.

c. Given a clock with numbers 1-12, a big hand and a little hand, the student will identify the correct number, represented in digital format, designated by the big hand 7 out of 8 times.

Lesson 10. Given a clock with verbal time cues, the student will identify the correct time, represented in digital format, designated on the clock 7 out of 8 times.

Lesson 11. Given a clock, the student will identify the correct time, represented in digital format, designated on the clock 7 out of 8 times.

APPENDIX B

Coin Identification

Coin Identification

Program Objectives:

The student will be able to independently identify quarters, pennies, dimes, nickels, and half dollars.

Prerequisites:

Success is more likely if the student can do the following:

1. Match like items.
2. Follow simple directions.
3. Understand such words as find, alike, and same.

Lesson Objectives:

Lesson 1. Given a quarter and a penny, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 2. Given a quarter, a penny and a dime, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 3. Given a quarter, a penny, a dime and a nickel, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 4. Given a set of coins containing 2 quarters, 2 pennies, 2 dimes and 2 nickels, where like coins are displayed with different sides facing up, the student will correctly identify each coin 7 out of 8 times.

Lesson 5. Given a quarter, a penny, a dime, a nickel, and a half dollar, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 6. Given a set of coins containing 2 quarters, 2 pennies, 2 dimes, 2 nickels and 2 half dollars, where like coins are displayed with different sides facing up, the student will correctly identify each coin 7 out of 8 times.

APPENDIX C

Functional Word Recognition

Functional Word Recognition

Program Objectives:

The student will be able to recognize and read the following 8 functional words as they most frequently appear on signs in daily activities:

Bus
Walk
Don't Walk
Restrooms
Men
Women
Boys
Girls

Prerequisites:

Success is more likely if the student can do the following:

1. Understand words of opposite meanings (Walk/ Don't Walk).
2. Compare pictures and printed symbols.

Lesson Objectives:

Lesson 1a. Given 4 different pictures of common objects, one of which is a bus, the student will identify the picture of the bus 7 out of 8 times.

1b. Gien 4 different printed words, one of which is the word 'BUS', the student will identify the word 'BUS' 7 out of 8 times.

1c. Given 4 different common traffic and building signs, one of which is a 'BUS' sign, the student will identify the bus sign 7 out of 8 times.

1d. Given 4 different pictures of common traffic and building signs, one of which is a 'BUS' sign, and the printed word 'BUS', the student will identify the picture associated with the word 'BUS' 7 out of 8 times.

Lesson 2a. Given 4 different pictures, one of which is of a person walking, the student will identify the "picture for walk" 7 out of 8 times.

2b. Given 4 different printed words, one of which is the word 'WALK', the student will identify the word 'WALK' 7 out of 8 times.

2c. Given 4 different pictures of common traffic and building signs, one of which is of a 'WALK' sign, the student will identify the walk sign 7 out of 8 times.

2d. Given 4 different pictures of common traffic and building signs, one of which is of a 'WALK' sign, and the printed word 'WALK', the student will identify the picture associated with the word 'WALK' 7 out of 8 times.

Lesson 3a. Given 4 different pictures, one of which represents 'DON'T WALK' by depicting people standing still, the student will identify the picture of 'DON'T WALK' 7 out of 8 times.

3b. Given 4 different printed phrases one of which is the phrase 'DON'T WALK', the student will identify the phrase 'DON'T WALK' 7 out of 8 times.

3c. Given 4 different pictures of common traffice and building signs, one of which is of a 'DON'T WALK' sign, the student will identify the 'DON'T WALK' sign 7 out of 8 times.

3d. Given 4 different pictures of common traffic and building signs, one of which is of a 'DON'T WALK' sign, and the printed phrase 'DON'T WALK', the student will identify the picture associated with the words 'DON'T WALK' 7 out of 8 times.

Lesson 4a. Given 4 different pictures of common places, one of which is of a restroom, the student will identify the picture of a restroom 7 out of 8 times.

4b. Given 4 different printed words, one of which is the word 'RESTROOMS', the student will identify the word 'RESTROOMS' 7 out of 8 times.

4c. Given 4 different pictures of common traffic and building signs, one of which is of a 'RESTOOMS' sign, the student will identify the restrooms sign 7 out of 8 times.

4d. Given 4 different pictures of common traffic and building signs, one of which is of a 'RESTROOMS' sign, and the printed word 'RESTROOMS', the student will identify the picture associated with the word 'RESTROOMS' 7 out of 8 times.

Lesson 5a. Given 4 different pictures, one of which is of men, the student will identify the picture of the men 7 out of 8 times.

5b. Given 4 different printed words, one of which is the word 'MEN', the student will identify the word 'MEN' 7 out of 8 times.

5c. Given 4 different pictures of common traffice and building signs, one of which is of a 'MEN' sign on a restroom door, the student will identify the 'MEN' sign 7 out of 8 times.

5d. Given 4 different pictures of common traffic and building signs, one of which is of a 'MEN' sign on a restroom door, and the printed word 'MEN', the student will identify the picture associated with the word 'MEN' 7 out of 8 times.

Lesson 6a. Given 4 different pictures, one of which is a women, the student will identify the picture of the women 7 out of 8 times.

6b. Given 4 different printed words, one of which is of the word 'WOMEN', the student will identify the word 'WOMEN' 7 out of 8 times.

6c. Given 4 different pictures of common traffic and building signs, one of which is of a 'WOMEN' sign on a restroom door, the student will identify the 'WOMEN' sign 7 out of 8 times.

6d. Given 4 different pictures of common traffic and building signs, one of which is of a 'WOMEN' sign on a restroom door, and the printed word 'WOMEN', the student will identify the picture associated with the word 'WOMEN' 7 out of 8 times.

Lesson 7a. Given 4 different pictures, one of which is of boys, the student will identify the picture of the boys 7 out of 8 times.

7b. Given 4 different printed words, one of which is the word 'BOYS', the student will identify the word "BOYS' 7 out of 8 times.

7c. Given 4 different pictures of common traffic and building signs, one of which is of a 'BOYS' sign on a restroom door, the student will identify the 'BOYS' sign 7 out of 8 times.

7d. Given 4 different pictures of common traffic and building signs, one of which is of a 'BOYS' sign on a restroom door, and the printed word 'BOYS', the student will identify the picture associated with the word 'BOYS' 7 out of 8 times.

Lesson 8a. Given 4 different pictures, one of which is of girls, the student will identify the picture of the girls 7 out of 8 times.

8b. Given 4 different printed words, one of which is the word 'GIRLS', the student will identify the word 'GIRLS' 7 out of 8 times.

8c. Given 4 different pictures of common traffic and building signs, one of which is of a 'GIRLS' sign on a restroom door, the student will identify the 'GIRLS' sign 7 out of 8 times.

8d. Given 4 different pictures of common traffic and building signs, one of which is of a 'GIRLS' sign on a restroom door, and the printed word 'GIRLS', the student will identify the picture associated with the word 'GIRLS' 7 out of 8 times.

APPENDIX D

Directional Prepositions

Directional Prepositions

Program Objectives:

The student will be able to correctly identify an object in a particular position as it relates to another object, i.e. in, out, on, under, in front of or behind the other object.

Prerequisites:

Success is more likely if the student can do the following:

1. Follow simple directions.

Lesson Objectives:

Lesson 1. Given an example containing an object that is "in" and an object that is "out", the student will touch the object that is "in" with 100% accuracy.

Given an example containing an object that is "in" and an object that is "out", the student will touch the object that is "out" with 100% accuracy.

Lesson 2. Given an example containing an object that is "on" and an object that is "under", the student will touch the object that is "on" with 100% accuracy.

Given an example containing an object that is "on" and an object that is "under", the student will touch the object that is "under" with 100% accuracy.

Lesson 3. When given an example containing an object that is "in front of" and an object that is "behind", the student will touch the object that is "in front of" with 100% accuracy.

When given an example containing an object that is "in front of" and an object that is "behind", the student will touch the object that is "behind" with 100% accuracy.

APPENDIX E

Beginning Sight Reading

Version 1

Sight Reading 1

Program Objectives:

1) The student will be able to identify the following sight words:

apple	see
house	a
red	

2) The student will be able to correctly match pictures and phrases, (using the words apple, house, red, see and/or a).

Prerequisites:

Success is more likely if the student can do the following:

1. Follow simple directions
2. Identify basic colors

Lesson Objectives:

Lesson 1. Given the printed words "yes" and "no", the student will touch the word "yes" when asked with 100% accuracy.

Given the printed words "yes" and "no", the student will touch the word "no" when asked with 100% accuracy.

Given a picture and the printed words "yes" and "no", the student will correctly answer a question about the picture by touching "yes" or "no" with 100% accuracy.

Lesson 2. Given three different printed words, one of which is the word "apple", the student will touch the word "apple" with 100% accuracy.

Given three different printed words (one of which is the word "apple") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 3. Given three different printed words, one of which is the word "house", the student will touch the word "house" with 90% accuracy.

Given three different printed words (one of which is the word "house") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 4. Given three different printed words, one of which is the word "red", the student will touch the word "red" with 90% acuracy.

Given three different printed words (one of which is the word "red") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 5. Given three different printed words, one of which is the word "a", the student will touch the word "a" with 90% accuracy.

Given three different printed words (one of which is the word "a") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 6. Given three different printed words, one of which is the word "see", the student will touch the word "see" with 90% accuracy.

Given three different printed words (one of which is the word "see") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 7. Given three different pictures and one phrase, the student will touch the picture that goes with the phrase, with 90% accuracy.

Given one picture and three phrases, the student will touch the phrase that goes with the picture, with 90% accuracy.

APPENDIX F

Beginning Sight Reading

Version 2

Sight Reading 2

Program Objectives:

1) The student will be able to identify the following sight words:

apple	see
house	a
red	

2) The student will be able to correctly match pictures and phrases, (using the words apple, house, red, see and/or a).

Prerequisites:

Success is more likely if the student can do the following:

1. Follow simple directions
2. Identify basic colors

Lesson Objectives:

Lesson 1. Given the printed words "yes" and "no", the student will touch the word "yes" when asked.

Given the printed words "yes" and "no", the student will touch the word "no" when asked.

Given a picture and the printed words "yes" and "no", the student will correctly answer a question about the picture by touching "yes" or "no".

Lesson 2. Given three different printed words, one of which is the word "apple", the student will touch the word "apple".

Given three different printed words (one of which is the word "apple") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 3. Given three different printed words, one of which is the word "house", the student will touch the word "house".

Given three different printed words (one of which is the word "house") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 4. Given three different printed words, one of which is the word "red", the student will touch the word "red".

Given three different printed words (one of which is the word "red") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 5. Given three different printed words, one of which is the word "a", the student will touch the word "a".

Given three different printed words (one of which is the word "a") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 6. Given three different printed words, one of which is the word "see", the student will touch the word "see".

Given three different printed words (one of which is the word "see") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 7. Given three different pictures and one phrase, the student will touch the picture that goes with the phrase.

Given one picture and three phrases, the student will touch the phrase that goes with the picture.

*NOTE - Lesson objectives do not indicate a mastery level because in each lesson (1-7) the student must successfully complete the objectives with 100% accuracy before s/he will be allowed to move to the next lesson.

APPENDIX G

Quick Reference Sheet

IVSET QUICK REFERENCE SHEET

E–Ends a session before the specified session length is up.

S–Stops the teacher signal.

G–Tells the program to go on after a teacher signal is stopped.

CONTROL RESET–Restarts the system without turning the power off.

CONTROL A–Switches characters you type on screen from lower case to upper case and visa versa.

Appendix B

TIME TELLING OBJECTIVES

AND SAMPLE SCRIPT

Timetelling

Program Objectives:

1) The student will be able to look at a clock-face and identify the correct time to five minute intervals.

2) The student will be able to identify the correct time to five minute intervals when represented in a 'digital' format such as "1:25".

Prerequisites:

This program assumes the student can count and read the numbers 0-55 by fives. The student must also be able to discriminate big and little hands on the clock, and either red and green OR the written words yes and no.

Lesson Objectives:

Lesson 1. Given a clock with no hands and some missing numbers, the student will identify the correct number for the appropriate circle on the clock 7 out of 8 times.

Lesson 2. Given a clock with no hands or numbers, the student will identify the correct number for the appropriate circle on the clock 7 out of 8 times.

Lesson 3. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 1-6, for the appropriate circle designated by the little hand 7 out of 8 times.

Lesson 4. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 6-11, for the appropriate circle designated by the little hand 7 out of 8 times.

Lesson 5. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 12 and 1, for the appropriate circle designated by the little hand 7 out of 8 times.

Lesson 6. Given a clock with some missing numbers and a little hand, the student will identify the correct number, 1-12, represented in digital format, designated by the little hand 7 out of 8 times.

Lesson 7. Given a clock with some missing numbers, a little hand, and a big hand, the student will identify the correct number, represented in digital format, designated by the little hand 7 out of 8 times.

Lesson 8. Given a clock with no hands and some numbers around the outside of the clock in intervals of 5, 0-55, the student will identify the correct number for the appropriate square 7 out of 8 times.

Lesson 9. a. Given the numbers in intervals of 5, 0-55, around the outside of the clock, and a big hand, the student will identify the correct number designated by the big hand 3 out of 4 times.

b. Given a clock with numbers 1-12 and a big hand, the student will identify the correct number in digital format, designated by the big hand 7 out of 8 times.

c. Given a clock with numbers 1-12, a big hand and a little hand, the student will identify the correct number, represented in digital format, designated by the big hand 7 out of 8 times.

Lesson 10. Given a clock with verbal time cues, the student will identify the correct time, represented in digital format, designated on the clock 7 out of 8 times.

Lesson 11. Given a clock, the student will identify the correct time, represented in digital format, designated on the clock 7 out of 8 times.

AUDIO	VIDEO	
AUDIO 1: Touch the number for the first circle. SF# 3C:C EF# 4C:C	ASSOCIATED VIDEO 	☒ VIDEODISC [ ] TEXT [ ] GRAPHIC COMMENTS: circle 1 only
AUDIO 2: Touch the number for the next circle. SF# 3C:5C EF# 4C:C	ASSOCIATED VIDEO (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	

IVSET
Interactive Videodisc for Special Education Technology

☒ INSTRUCTION [ ] REMEDIATION [ ] TEST [ ] FEEDBACK

AUDIO	VIDEO	
AUDIO 1: Touch the number for the first circle. SF= 3252 EF= 4616	ASSOCIATED VIDEO 	☒ VIDEODISC ☒ TEXT [ ] GRAPHIC COMMENTS: # 2 is generated by Apple + placed in first circle. ~~the~~ else audio track 2
AUDIO 2: Touch the number for the next circle. SF= 4252 EF= 4616	ASSOCIATED VIDEO (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	IVSET Interactive Videodisc for Special Education Technology

☒ INSTRUCTION [ ] REMEDIATION [ ] TEST [ ] FEEDBACK

QUESTION # 460

Appendix C

COIN IDENTIFICATION OBJECTIVES, PREREQUISITE SKILLS AND SAMPLE SCRIPT

Coin Identification

Program Objectives:

The student will be able to independently identify quarters, pennies, dimes, nickels, and half dollars.

Prerequisites:

Success is more likely if the student can do the following:

1. Match like items.
2. Follow simple directions.
3. Understand such words as find, alike, and same.

Lesson Objectives:

Lesson 1. Given a quarter and a penny, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 2. Given a quarter, a penny and a dime, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 3. Given a quarter, a penny, a dime and a nickel, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 4. Given a set of coins containing 2 quarters, 2 pennies, 2 dimes and 2 nickels, where like coins are displayed with different sides facing up, the student will correctly identify each coin 7 out of 8 times.

Lesson 5. Given a quarter, a penny, a dime, a nickel, and a half dollar, the student will correctly identify the designated coin 7 out of 8 times.

Lesson 6. Given a set of coins containing 2 quarters, 2 pennies, 2 dimes, 2 nickels and 2 half dollars, where like coins are displayed with different sides facing up, the student will correctly identify each coin 7 out of 8 times.

AUDIO	VIDEO	
AUDIO 1: Touch the nickel. SF= 10004 EF= 10037	**ASSOCIATED VIDEO** 	[X] VIDEODISC [ ] TEXT [ ] GRAPHIC **COMMENTS:**
AUDIO 2: SF= _____ EF= _____	**ASSOCIATED VIDEO** (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	IVSET Interactive Videodisc for Special Education Technology

[X] INSTRUCTION [ ] REMEDIATION [ ] TEST [ ] FEEDBACK

QUESTION # _____

Appendix D

FUNCTIONAL WORD RECOGNITION OBJECTIVES,

PREREQUISITE SKILLS AND

SCRIPT SAMPLE

Functional Word Recognition

Program Objectives:

The student will be able to recognize and read the following 8 functional words as they most frequently appear on signs in daily activities:

- Bus
- Walk
- Don't Walk
- Restrooms
- Men
- Women
- Boys
- Girls

Prerequisites:

Success is more likely if the student can do the following:

1. Understand words of opposite meanings (Walk/Don't Walk).
2. Compare pictures and printed symbols.

Lesson Objectives:

Lesson 1a. Given 4 different pictures of common objects, one of which is a bus, the student will identify the picture of the bus 7 out of 8 times.

1b. Gien 4 different printed words, one of which is the word 'BUS', the student will identify the word 'BUS' 7 out of 8 times.

1c. Given 4 different common traffic and building signs, one of which is a 'BUS' sign, the student will identify the bus sign 7 out of 8 times.

1d. Given 4 different pictures of common traffic and building signs, one of which is a 'BUS' sign, and the printed word 'BUS', the student will identify the picture associated with the word 'BUS' 7 out of 8 times.

Lesson 2a. Given 4 different pictures, one of which is of a person walkirg, the student will identify the "picture for walk" 7 out of 8 times.

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2b. Given 4 different printed words, one of which is the word 'WALK', the student will identify the word 'WALK' 7 out of 8 times.

2c. Given 4 different pictures of common traffic and building signs, one of which is of a 'WALK' sign, the student will identify the walk sign 7 out of 8 times.

2d. Given 4 different pictures of common traffic and building signs, one of which is of a 'WALK' sign, and the printed word 'WALK', the student will identify the picture associated with the word 'WALK' 7 out of 8 times.

Lesson 3a. Given 4 different pictures, one of which represents 'DON'T WALK' by depicting people standing still, the student will identify the picture of 'DON'T WALK' 7 out of 8 times.

3b. Given 4 different printed phrases one of which is the phrase 'DON'T WALK', the student will identify the phrase 'DON'T WALK' 7 out of 8 times.

3c. Given 4 different pictures of common traffice and building signs, one of which is of a 'DON'T WALK' sign, the student will identify the 'DON'T WALK' sign 7 out of 8 times.

3d. Given 4 different pictures of common traffic and building signs, one of which is of a 'DON'T WALK' sign, and the printed phrase 'DON'T WALK', the student will identify the picture associated with the words 'DON'T WALK' 7 out of 8 times.

Lesson 4a. Given 4 different pictures of common places, one of which is of a restroom, the student will identify the picture of a restroom 7 out of 8 times.

4b. Given 4 different printed words, one of which is the word 'RESTROOMS', the student will identify the word 'RESTROOMS' 7 out of 8 times.

4c. Given 4 different pictures of common traffic and building signs, one of which is of a 'RESTOOMS' sign, the student will identify the restrooms sign 7 out of 8 times.

4d. Given 4 different pictures of common traffic and building signs, one of which is of a 'RESTROOMS' sign, and the printed word 'RESTROOMS', the student will identify the picture associated with the word 'RESTROOMS' 7 out of 8 times.

Lesson 5a. Given 4 different pictures, one of which is of men, the student will identify the picture of the men 7 out of 8 times.

5b. Given 4 different printed words, one of which is the word 'MEN', the student will identify the word 'MEN' 7 out of 8 times.

5c. Given 4 different pictures of common traffice and building signs, one of which is of a 'MEN' sign on a restroom door, the student will identify the 'MEN' sign 7 out of 8 times.

5d. Given 4 different pictures of common traffic and building signs, one of which is of a 'MEN' sign on a restroom door, and the printed word 'MEN', the student will identify the picture associated with the word 'MEN' 7 out of 8 times.

Lesson 6a. Given 4 different pictures, one of which is a women, the student will identify the picture of the women 7 out of 8 times.

6b. Given 4 different printed words, one of which is of the word 'WOMEN', the student will identify the word 'WOMEN' 7 out of 8 times.

6c. Given 4 different pictures of common traffic and building signs, one of which is of a 'WOMEN' sign on a restroom door, the student will identify the 'WOMEN' sign 7 out of 8 times.

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6d. Given 4 different pictures of common traffic and building signs, one of which is of a 'WOMEN' sign on a rest-room door, and the printed word 'WOMEN', the student will identify the picture associated with the word 'WOMEN' 7 out of 8 times.

Lesson 7a. Given 4 different pictures, one of which is of boys, the student will identify the picture of the boys 7 out of 8 times.

7b. Given 4 different printed words, one of which is the word 'BOYS', the student will identify the word "BOYS' 7 out of 8 times.

7c. Given 4 different pictures of common traffic and building signs, one of which is of a 'BOYS' sign on a rest-room door, the student will identify the 'BOYS' sign 7 out of 8 times.

7d. Given 4 different pictures of common traffic and building signs, one of which is of a 'BOYS' sign on a restroom door, and the printed word 'BOYS', the student will identify the picture associated with the word 'BOYS' 7 out of 8 times.

Lesson 8a. Given 4 different pictures, one of which is of girls, the student will identify the picture of the girls 7 out of 8 times.

8b. Given 4 different printed words, one of which is the word 'GIRLS', the student will identify the word 'GIRLS' 7 out of 8 times.

8c. Given 4 different pictures of common traffic and building signs, one of which is of a 'GIRLS' sign on a rest-room door, the student will identify the 'GIRLS' sign 7 out of 8 times.

8d. Given 4 different pictures of common traffic and building signs, one of which is of a 'GIRLS' sign on a restroom door, and the printed word 'GIRLS', the student will identify the picture associated with the word 'GIRLS' 7 out of 8 times.

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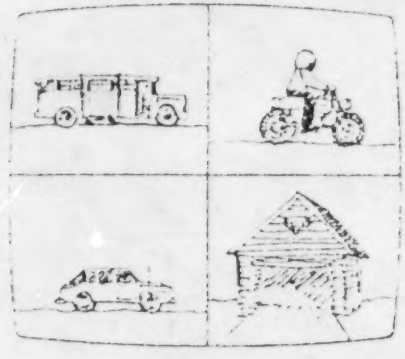
AUDIO	VIDEO	
AUDIO 1: Touch the bus. SF# _____ EF# _____	ASSOCIATED VIDEO 	[ ] VIDEODISC [ ] TEXT [ ] GRAPHIC COMMENTS:
AUDIO 2: SF# _____ EF# _____	ASSOCIATED VIDEO (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	IVSET Interactive Videodisc for Special Education Technology

[ ] INSTRUCTION [ ] REMEDIATION [ ] TEST [ ] FEEDBACK

QUESTION # _____

Appendix E

DIRECTIONAL PREPOSITIONS OBJECTIVES,

PREREQUISITE SKILLS AND

SCRIPT SAMPLE

Directional Prepositions

Program Objectives:

The student will be able to correctly identify an object in a particular position as it relates to another object, i.e. in, out, on, under, in front of or behind the other object.

Prerequisites:

Success is more likely if the student can do the following:

1. Follow simple directions.

Lesson Objectives:

Lesson 1. Given an example containing an object that is "in" and an object that is "out", the student will touch the object that is "in" with 100% accuracy.

Given an example containing an object that is "in" and an object that is "out", the student will touch the object that is "out" with 100% accuracy.

Lesson 2. Given an example containing an object that is "on" and an object that is "under", the student will touch the object that is "on" with 100% accuracy.

Given an example containing an object that is "on" and an object that is "under", the student will touch the object that is "under" with 100% accuracy.

Lesson 3. When given an example containing an object that is "in front of" and an object that is "behind", the student will touch the object that is "in front of" with 100% accuracy.

When given an example containing an object that is "in front of" and an object that is "behind", the student will touch the object that is "behind" with 100% accuracy.

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Appendix F

BEGINNING SIGHT READING 1 OBJECTIVES,

PREREQUISITE SKILLS AND

SCRIPT SAMPLE

Sight Reading 1

Program Objectives:

1) The student will be able to identify the following sight words:

apple	see
house	a
red	

2) The student will be able to correctly match pictures and phrases, (using the words apple, house, red, see and/or a).

Prerequisites:

Success is more likely if the student can do the following:

1. Follow simple directions
2. Identify basic colors

Lesson Objectives:

Lesson 1. Given the printed words "yes" and "no", the student will touch the word "yes" when asked with 100% accuracy.

Given the printed words "yes" and "no", the student will touch the word "no" when asked with 100% accuracy.

Given a picture and the printed words "yes" and "no", the student will correctly answer a question about the picture by touching "yes" or "no" with 100% accuracy.

Lesson 2. Given three different printed words, one of which is the word "apple", the student will touch the word "apple" with 100% accuracy.

Given three different printed words (one of which is the word "apple") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 3. Given three different printed words, one of which is the word "house", the student will touch the word "house" with 90% accuracy.

Given three different printed words (one of which is the word "house") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 4. Given three different printed words, one of which is the word "red", the student will touch the word "red" with 90% acuracy.

Given three different printed words (one of which is the word "red") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 5. Given three different printed words, one of which is the word "a", the student will touch the word "a" with 90% accuracy.

Given three different printed words (one of which is the word "a") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 6. Given three different printed words, one of which is the word "see", the student will touch the word "see" with 90% accuracy.

Given three different printed words (one of which is the word "see") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no" with 90% accuracy.

Lesson 7. Given three different pictures and one phrase, the student will touch the picture that goes with the phrase, with 90% accuracy.

Given one picture and three phrases, the student will touch the phrase that goes with the picture, with 90% accuracy.

AUDIO	VIDEO	
AUDIO 1: Is this the word red? Touch yes or no. SF= 45000 EF= 45116	ASSOCIATED VIDEO red ← Touch points bird house yes no	[X] VIDEODISC [ ] TEXT [ ] GRAPHIC COMMENTS:
AUDIO 2: SF= _____ EF= _____	ASSOCIATED VIDEO (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	IVSET Interactive Videodisc for Special Education Technology

[X] INSTRUCTION [ ] REMEDIATION [ ] TEST [ ] FEEDBACK

QUESTION # _____

AUDIO	VIDEO	
AUDIO 1: Touch the word apple. SF# 1.1.11 EF# 1.1.12	ASSOCIATED VIDEO **apple** **red** **bird**	[X] VIDEODISC [ ] TEXT [ ] GRAPHIC COMMENTS:
AUDIO 2: SF# _____ EF# _____	ASSOCIATED VIDEO (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	

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Interactive Videodisc for Special Education Technology

[X] INSTRUCTION [ ] REMEDIATION [ ] TEST [ ] FEEDBACK

QUESTION # _____

Appendix G

BEGINNING SIGHT READING 2 OBJECTIVES,

PREREQUISITE SKILLS AND

SCRIPT SAMPLE

Sight Reading 2

Program Objectives:

1) The student will be able to identify the following sight words:

apple	see
house	a
red	

2) The student will be able to correctly match pictures and phrases, (using the words apple, house, red, see and/or a).

Prerequisites:

Success is more likely if the student can do the following:

1. Follow simple directions
2. Identify basic colors

Lesson Objectives:

Lesson 1. Given the printed words "yes" and "no", the student will touch the word "yes" when asked.

Given the printed words "yes" and "no", the student will touch the word "no" when asked.

Given a picture and the printed words "yes" and "no", the student will correctly answer a question about the picture by touching "yes" or "no".

Lesson 2. Given three different printed words, one of which is the word "apple", the student will touch the word "apple".

Given three different printed words (one of which is the word "apple") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 3. Given three different printed words, one of which is the word "house", the student will touch the word "house".

Given three different printed words (one of which is the word "house") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 4. Given three different printed words, one of which is the word "red", the student will touch the word "red".

Given three different printed words (one of which is the word "red") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 5. Given three different printed words, one of which is the word "a", the student will touch the word "a".

Given three different printed words (one of which is the word "a") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 6. Given three different printed words, one of which is the word "see", the student will touch the word "see".

Given three different printed words (one of which is the word "see") and the printed choices "yes" and "no", the student will correctly answer a question about the words by touching "yes" or "no".

Lesson 7. Given three different pictures and one phrase, the student will touch the picture that goes with the phrase.

Given one picture and three phrases, the student will touch the phrase that goes with the picture.

*NOTE - Lesson objectives do not indicate a mastery level because in each lesson (1-7) the student must successfully complete the objectives with 100% accuracy before s/he will be allowed to move to the next lesson.

Appendix H

LIGHT INTERRUPT TOUCH PANEL INSTALLATION AND OPERATION

LIGHT INTERRUPT TOUCH PANEL INSTALLATION AND OPERATION

IVSET

Interactive Videodisc for
Special Education Technology
Utah State University

This document is a release of the INTERACTIVE VIDEODISC FOR SPECIAL EDUCATION TECHNOLOGY (IVSET) project at Utah State University's Exceptional Child Center. The IVSET project is funded in part by the Office of Special Education, Department of Education, Project #G007904510. This document does not reflect the policy or position of the Office of Special Education nor should any official endorsement be implied.

For further information, contact:

Ron J. Thorkildsen
UMC 68
Exceptional Child Center
Utah State University
Logan, Utah 84322

Alan M. Hofmeister
UMC 09
School of Graduate Studies
Utah State University
Logan, Utah 84322

Kim E. Allard
UMC 68
Exceptional Child Center
Utah State Unviersity
Logan, Utah 84322

Light Interrupt Touch Panel Installation and Operation

IVSET

Interactive Videodisc for Special Education Technology Project

Utah State University

Logan, Utah

Prepared by:

Kim E. Allard
Exceptional Child Center
UMC 68
Utah State University
Logan, Utah 84322
(801) 750-2329

Technical Assistance Provided by:

Bob Lake
Russell Awakuni
Rick Sidwell

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PREFACE

This manual describes the steps necessary to install and operate a light-interrupt touch panel with a color television monitor. This touch panel allows the user to input data to a microcomputer by touching the screen as opposed to entering data at the keyboard or with a paddle device. This particular touch panel configuration was designed as part of the Interactive Videodisc for Special Education Technology project at Utah State University's Exceptional Child Center. Support for the project was provided by the Office of Special Education, Department of Education, Washington D. C. (Grant # G007904510). While every attempt has been made to insure accuracy in this document, neither the authors nor the Office of Special Education will be responsible for any problems incurred in installing your own touch panel. It is highly recommended that a qualified individual with an electronics background be employed to follow these directions in installing the touch panel.

DESCRIPTION OF IVSET SYSTEM

The touch panel used in the system is the Carroll Manufacturing Touch Input System Kit. It is available from: Carroll Manufacturing, 1212 Hagan, Champaign, Illinois 61820. The kit consists of 4 circuit boards and a control box. The circuit boards were imbedded in the front plastic faceplate of a Sony CVM 12" color television monitor. The touch panel control box was interfaced with an Apple II microcomputer (with dual floppy disk drives) using an RS232 serial interface board. A DVA 7820 videodisc player is also interfaced with the Apple II microcomputer to provide audio-video images.

DESCRIPTION OF TOUCH PANEL

The touch panel circuit boards imbedded on the left side and bottom of the monitor faceplate are lined with LED emitters. The touch panel circuit boards on the right side and top of the monitor faceplate contain phototransistor detectors. This placement provides a 24 X 39 grid of infared beams. An interruption of this infared scanning provides x, y coordinates which are then transmitted to the Apple II microcomputer. Although this particular touch panel was intended for use in cathode ray tubes (CRT's), it has been successfully installed and used in the Sony CVM 1250 12" color television monitor.

INSTALLATION INTRODUCTION

Installation of the touch panel involves implating the 4 circuit boards in the front plastic faceplate of the television monitor. This faceplate is the support for the monitor's operation and adjustment controls. Slots are cut in the faceplate on the top, bottom and each side to allow insertion of each of the four circuit boards.

MATERIALS NECESSARY

48" of 1 1/2" x 1/2" x 1/16" aluminum angle stock
48" of 3/4" x 3/4" oak, 90 degree edge molding
8- #8 x 32 x 1/2" bolts with nuts
2- #8 x 32 x 1/4" bolts with nuts
8- 1/8" rubber grommets
4- 1/4" x 1/16" selftaping screws
8- 1/4" x 1/16" x 1/2" selftaping screws
4- 1/4" light duty springs
4- 4" x 10" x .1" sheets of "easy solder tin" (found in hobby stores)
solder

TOOLS NECESSARY

Phillips screw driver
wire cutters
pliers
band or jigsaw
files
low power soldering iron and desoldering tools
10 mm wrench
power drill and bits
Dremel Moto Tool or similar routing/reaming tool

DISASSEMBLY PROCEDURE

1). Remove the 2 chassis mounting screws located on the bottom of the CVM 1250 cabinet.

2). Remove all screws from the back cover and remove it.

3). Remove the final chassis mounting screw located inside the cabinet on the left hand side at the front of the cabinet.

4). Remove the knobs from inside the panel controls door.

5). Place the monitor on its face with the picture tube resting on a book of other suitable support so that the faceplate may be easily dropped down and removed when this step is reached.

6). Slip the power cord holder out of its mounting slot in the cabinet.

7). Tie the input/output and UHF/VHF plates to a convenient place on the chassis to prevent breaking any wires connected to them during disassembly and assembly.

8). Carefully lift off the cabinet.

9). Remove the 3 screws holding the panel control mounting plate. Lift the mounting plate up off its alignment pins and tie it to the chassis again to prevent accidental wire damage.

10). Remove the 4 mounting bolts from the 4 corners of the picture tube. (Be especially careful now because the picture tube is loose and could easily fall out of its holder if the chassis is lifted).

11). Wire the picture tube holder frame to the chassis using the holes in the corners from which the bolts were removed in step 10 (this prevents the picture tube from falling out).

12). Carefully set the chassis up and keep it from falling forward by supporting it under the front of the picture tube.

13). Swing the whole faceplate assembly away from the chassis to get access to the 4 screws holding the speaker/tuner faceplate to the picture tube framing faceplate.

14). Remove the screws holding the speaker/tuner faceplate and set the picture framing faceplate aside.

15). Tie the speaker/tuner faceplate to the chassis to prevent wire damage.

FACEPLATE MODIFICATION

1). Using a Dremel Moto-Tool or similar tool, bore 8 mm wide slots using the dimensions supplied in Diagram #1.

2). Cut cut the support struts below the corners of these slots. The struts connect the round column mounts (which the picture tube/chassis assembly was bolted to) to the outer framework of the faceplate.

CIRCUIT BOARD MODIFICATION

1). Unsolder and remove the cable connectors mounted on all 4 of the circuit boards.

2). Cut notches into the edges of the boards using the dimensions supplied in Diagram #2.

3). Drill mounting holes as indicated in Diagram #2.

4). Cut the connecting cables near the headers. Cut them off at an angle so that the one side of the ribbon cable is about 3 centimeters longer than the other.

5). Starting with the longest wire in the cable, split and tin 9 of the wires and discard the rest.

6). Again starting with the longest wire in the cable, solder the wires to the circuit boards where the cable connectors were. Begin with the connections closest to the photo elements and work back as more wires are soldered on. The wire ends should point in toward the center of the boards.

7). Once all of the boards have been connected this way, lay a line of epoxy cement along the wires to cement about 3 or 4 mm of wire and insulation to the boards. This provides strain relief preventing any wires from breaking during assembly.

8). Cover the noncomponent side of each circuit board with insulating tape to prevent contact with the metal frame.

MOUNTING FRAME FABRICATION

1). Using 1/2" x 1 1/2" x 1/16" aluminum 90 degree angle stock (available in hardware stores), mark on the 1/2" side of the aluminum, the mounting frame's top, bottom and sides to the lengths indicated in Diagram #3. Start with the top and then the left hand side followed by the bottom length, finishing up with the right side. The 1 1/2" side of the angle aluminum should be pointing towards the measurer during layout.

2). On the 1/2" side of the angle stock, mark lines at 90 degree angles to the length of the angle stock. Mark 2 more lines 45 degrees from these first length marks. These new 45 degree marks should have their focus at the junction of the sides of the angle stock.

3). On these 45 degree marks, with the rounded sides pointing towards the center of the sections, mark 45 degrees of a 1 centimeter diameter circle. Align these circle segments so that when the sections are bent 90 degrees to join, there will be formed a half circle with its center line bisecting the 90 degree angle formed by the bend. (Refer to Diagram #3 for clarity).

4). Cut off the excess angle stock on the ends of the measured layout at 45 degree angles. They should be cut so that when the frame is bent at the 3 section corners these ends will join to make a 90 degree joint. Drill mounting holes as per Diagram #3.

5). Using a metal cutting blade in either a jigsaw or bandsaw, cut out all of the 1/2" side except for the parts formed by the marked circles.

6). Cut out the 90 degree wedges preventing the sections from being bent to form the frame.

7). Bend the sections to form a 4 side frame as illustrated by Diagram #3.

8). Using a small section of the angle stock, make a corner brace. Drill holes and use screws and nuts to mount the corner brace where the unconnected sides meet.

9). Drill 1/16" holes in the center of the circles formed in the 4 corners to the frame.

STATIC SHIELD FABRICATION

1). Using thin sheet tin, trace out the 4 sides of the static shields shown in Diagram #4 onto the tin.

2). Trace out the corner pieces on the tin.

3). Lay out four 20 centimeter circles with 5 centimeter holes at the center of the circles.

4). Cut out the tin pieces laid out in steps 1-3.

5). Bend the corner connection pieces around the column mount supports in the faceplate to form them to shape. (Be careful, sheet metal is very sharp!)

6). Insert the static shields (curved surface towards the front) into the slots in the faceplate. Solder the shields to the corner connecting pieces.

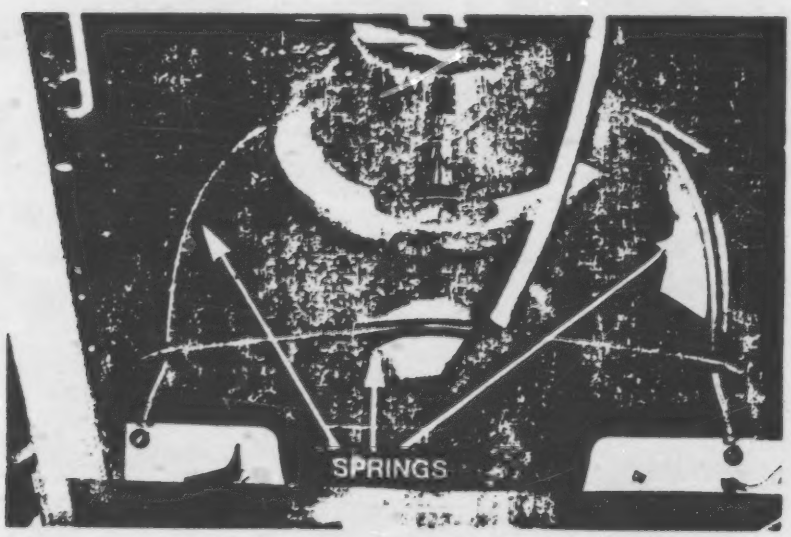
7). Using the bolts which mount the picture tube/chassis to the faceplate, bolt the circles cut from the tin to the column mount supports. Bend down the edges which overlap the corner connection pieces and solder them to the corner connection pieces.

8). Remove the bolts, take out the static shield and cover the outside surfaces with insulating tape. Make sure the curved edges are covered so that they will not contact the photoelements' casings and short them to ground.

9). Put the static shield back into the faceplate.

EXTRA STATIC PROTECTION

1). To reduce general static build up around the picture tube, ground the picture tube by attaching springs around it as shown below. Holes and chassis connecting screws are already available to attach the springs and ground them.



ASSEMBLY

1). Insert #8 x 32 x 1/2" bolts into the mounting frame for the circuit boards mounting holes already drilled.

2). Put 1/4" rubber grommets onto these bolts inside the frame.

3). Put the circuit boards onto the bolts and bolt them down with self locking nuts.

4). Slip the boards with the frame attached into the slots in the faceplate.

5). For the IVSET panel, align the left hand board so that the center of the uppermost photoelement is 1 5/8" down from the line engraved in the faceplate. This line goes completely around the faceplate and is curved as it goes around the corners. Measurement is made from this line (at the top just where the curve begins to make its downward bend) to the center of the first photoelement.

6). For the IVSET panel, align the bottom boards so that the center of the left most photoelement is 1 5/8" from the line on the left hand of the faceplate. This is done exactly as in step 5 (except now the curve will be curving from left to right).

7). Drill pilot holes (through the holes drilled in the aluminum circles) at the 4 corners of the frame into the faceplate. Make sure the frame is held square during this step and that the alignment done in steps 5 and 6 is not disturbed.

8). Using selftaping screws, mount the frame and circuit boards firmly to the faceplate. Arrange the wires so that they are tucked into the corners of the frame. Inspect the wires where they connect to the boards to be sure that none have been damaged.

9). Place the faceplate/touch panel assembly close to the chassis of the CVM 1250 and align it as if to reassemble it. The top frame member of the chassis has a ridge which will have to be notched into two places to allow the cable header and 2 large ceramic capacitors to clear. Mark the ridge where these components will have to fit. Using a hacksaw, saw through the ridge at the marks. Bend the ridge down. This will allow the components to clear.

10). Reconnect the speaker/turner faceplate to the modified picture tube faceplate.

11). Assembly is easier if the monitor is now set onto its face. Reverse the steps in the disassembly instructions to reconnect the faceplate assembly to the chassis and picture tube. Replace the panel control mounting plate.

12). Connect the ribbon cable main connecting cable to the top circuit board. Route it to the right as seen while facing the front of the chassis and tie it to the chassis using cable ties. Tie it where the main frame of the chassis starts towards the back of the set. Tie it also at the back end of this frame member.

13). Mount the UHF/VHF input plate to the back of the cabinet. Bring the touch panel main connecting ribbon cable around the right hand

side of this plate.

14). Reverse the disassembly steps from here on to finish the assembly process.

FRAME MOLDING CONSTRUCTION

1). The frame molding is made of 3/4" x 3/4" 90 degree edge molding normally used to finish up wood paneling. It is found in hardware stores. Cut 4 pieces with their ends at 45 degree angles. Use the outer dimensions of the frame to size these.

2). Drill 1/8" holes 1/2" from the ends of each of the molding pieces. Place them on the frame and drill holes in the frames at the locations of the holes in the molding pieces to accept selftaping screws. Use selftaping screws to attach these pieces to the frame. Make sure screws do not contact the circuit boards.

CONTROLLER BOX MODIFICATIONS AND SETUP

1). Remove the 3 screws holding the cover to the controller box. Remove the cover.

2). Set the uncover code (switch closest to back of box) to binary 65 (A). "on" = "0" and "off" = "1". The switch will look like this: on,off,on,on,on,on,on,off.

3). Set the closing code (switch next to the uncover code switch) to binary 66 (B). The switch will look like this: on,off,on,on,on,on,off,on.

4). Set the mode switch (next to the microprocessor near the front of the controller) to 12" frame size, stream, and the transmit codes to no parity. The switch will look like this: on,on,off,off,off.

5). Solder a wire between pin 7 and pin 33 on the solder side of the controller circuit board. This option adds 20 to the values sent as per IVSET software.

6). Replace the cover.

7). Set the baud rate switch (on the front of the controller) to "2".

SOFTWARE SUPPORT

The software that controls the touch panel is written in UCSD Pascal Version 1.1. The procedure which controls the touch panel resides within the Pascal program and is accessed as necessary.

```
PROCEDURE NEWTOUCH(*VAR X,Y:INTEGER;T:REAL*);

VAR
   G : PACKED ARRAY[0..3] OF CHAR;
   T,X,I:INTEGER;
   AR:ARRAY[1..4] OF REAL;
```

```
BEGIN
(*T is the number of seconds to wait for touch*)
TI:=ROUND(T);   TI:=815*TI;(*loop 815 times for each second*)
X:=-1; Y:=-1;(*coordinates will be -1 if timed out*)
FOR I:=1 TO TI DO
  BEGIN
  IF PEEK(-16224) < 128 THEN
     BEGIN
     UNITREAD(7,C,1);
     IF (ORD(C[0])-128) = 65 THEN
       BEGIN (*screen was touched*)
       UNITREAD(7,C[1],3);
       (*find coordinates*)
       X:=ORD(C[1])-128;  Y:=ORD(C[2])-128;
       XR:=X-31;  YR:=Y-31;
       X:=ROUND(XR/2); Y:=ROUND(YR/2);
       I:=TI;(*end loop*)
       END;
     END;



  END;
END; (*NEWTOUCH*)

BEGIN (*initialisation*)
SETSLOT(3); (*Default to slot 3*)
SETDATA(INTEXT,6); (*Disable IR control*)
SETDATA(AUD1,1);   (*Audio 1 on*)
SETDATA(AUD2,1);   (*Audio 2 on*)
SETDATA(FD,0);     (*Frame display off*)
END.
```

DIAGRAM #1

Scale – 1/2 cm = 1 cm

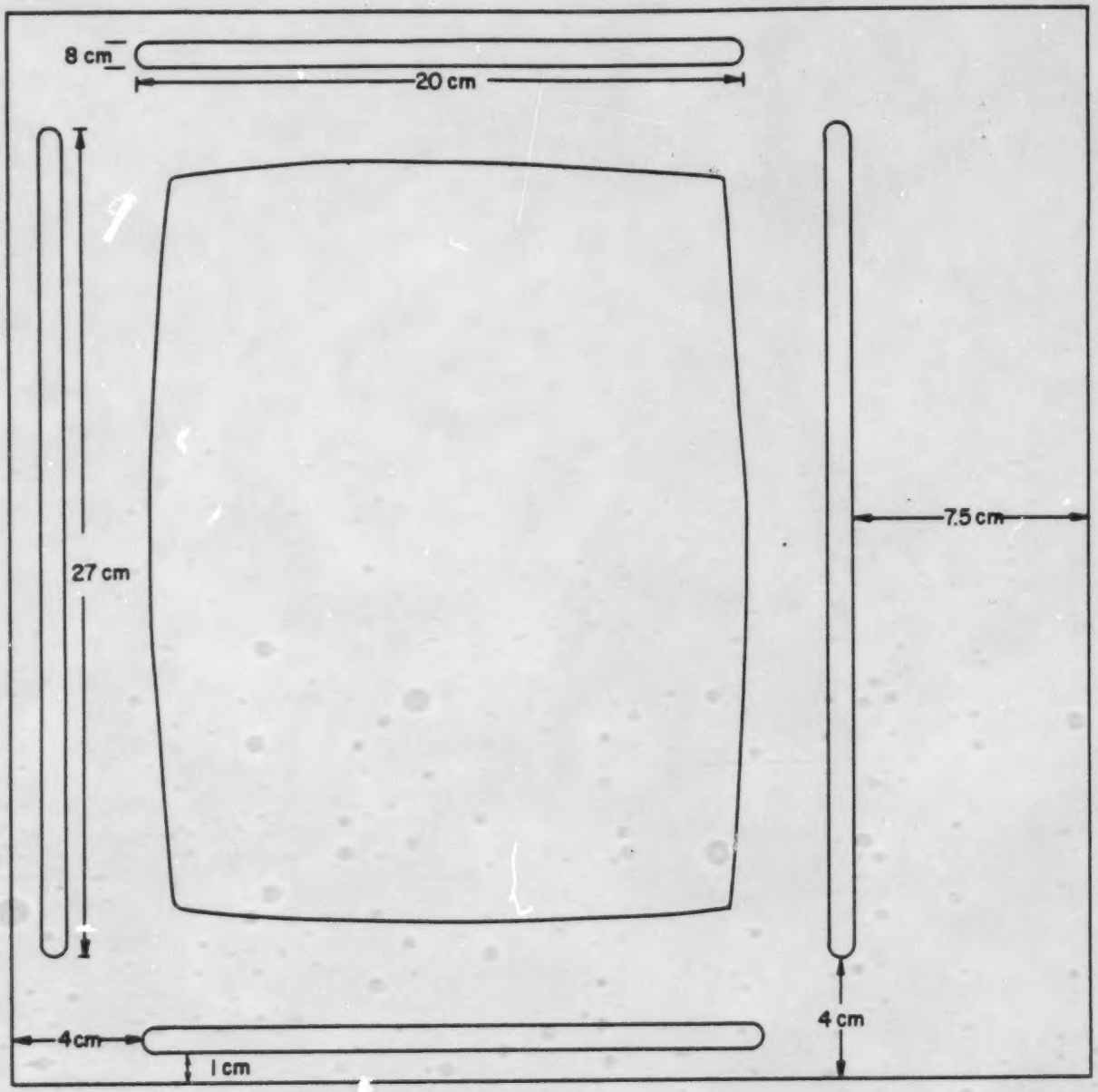


DIAGRAM # 2

Scale – 1/2 cm = 1 cm

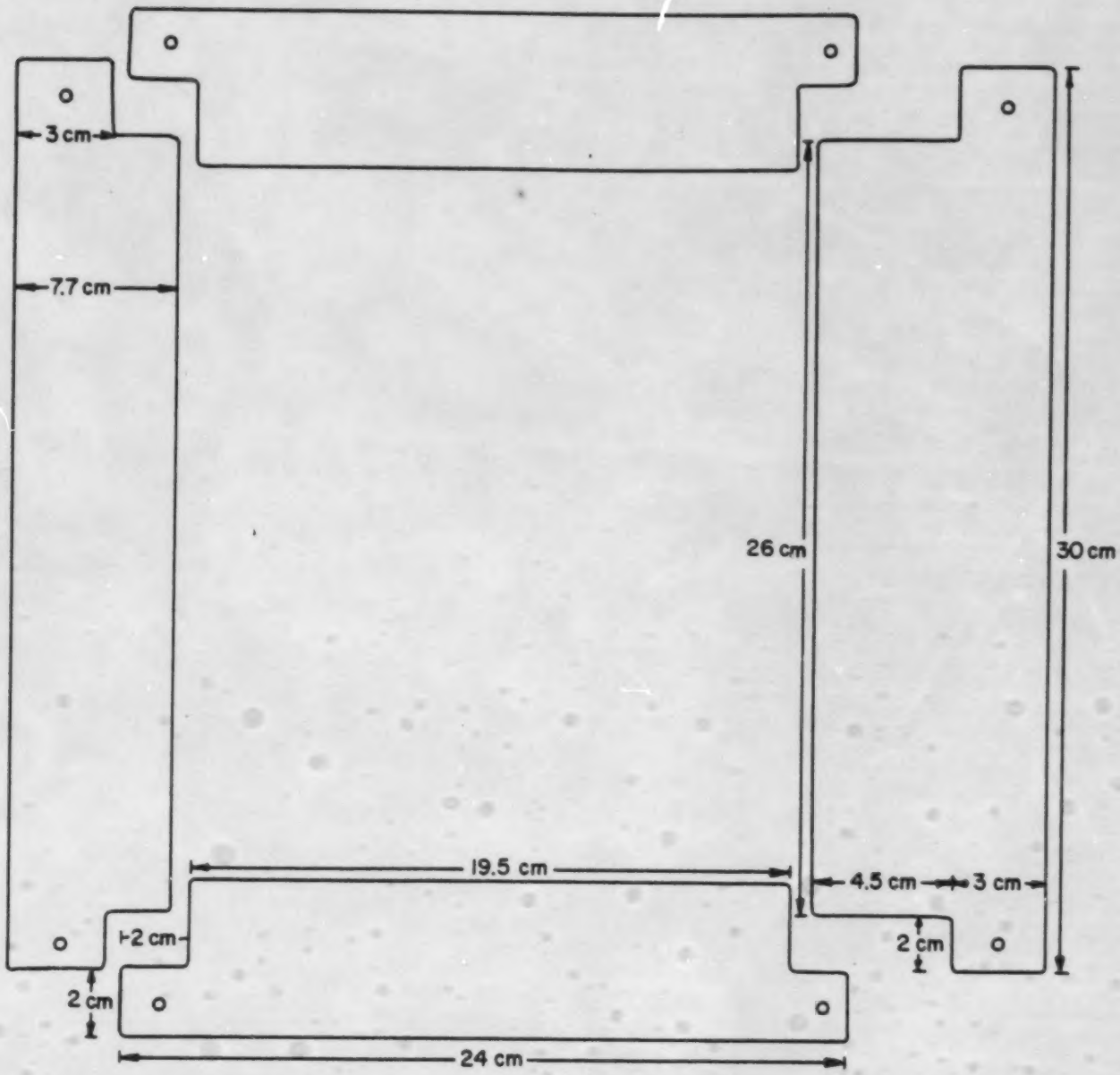


DIAGRAM # 3

Scale – 1/2 cm = 1 cm

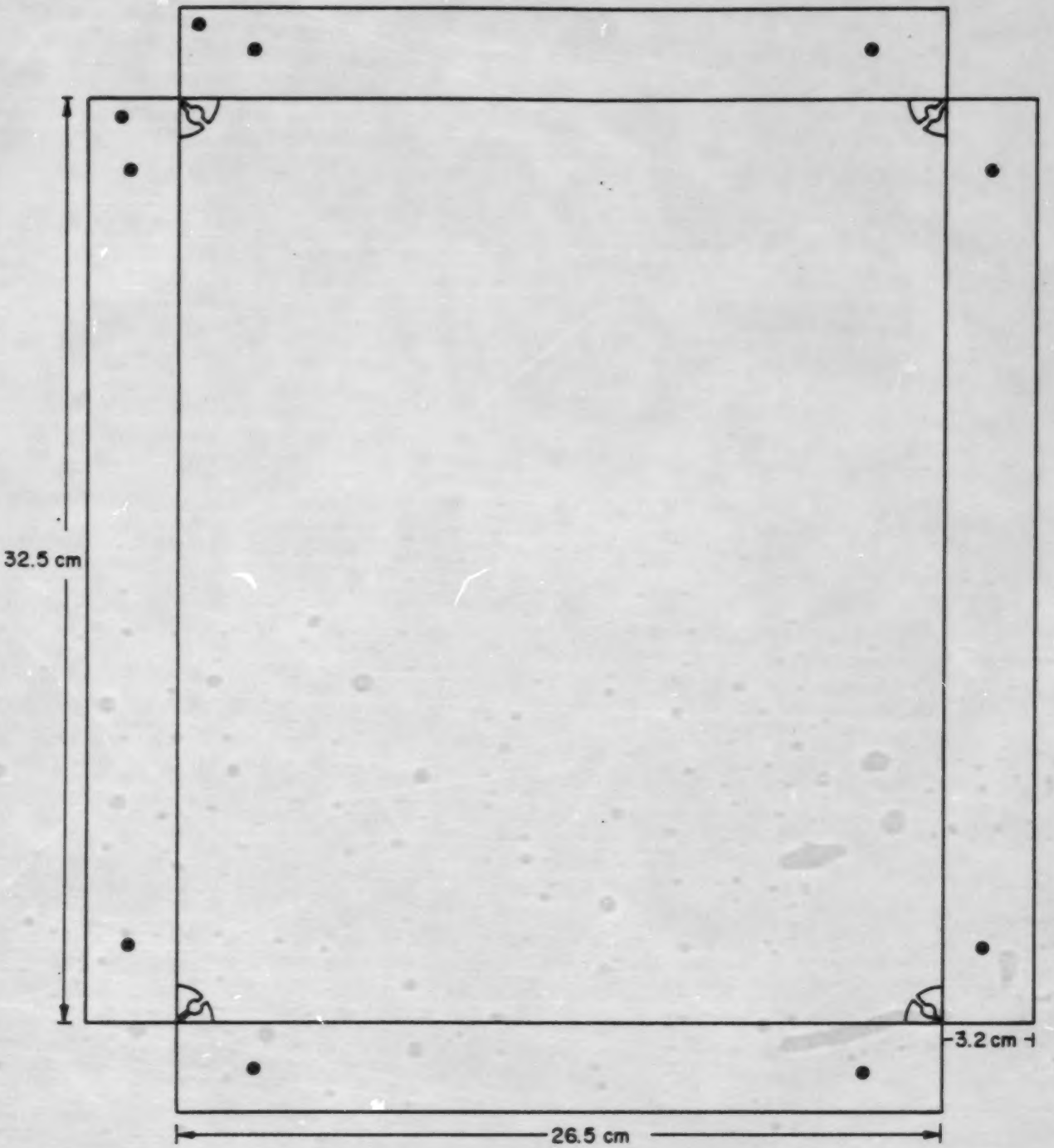
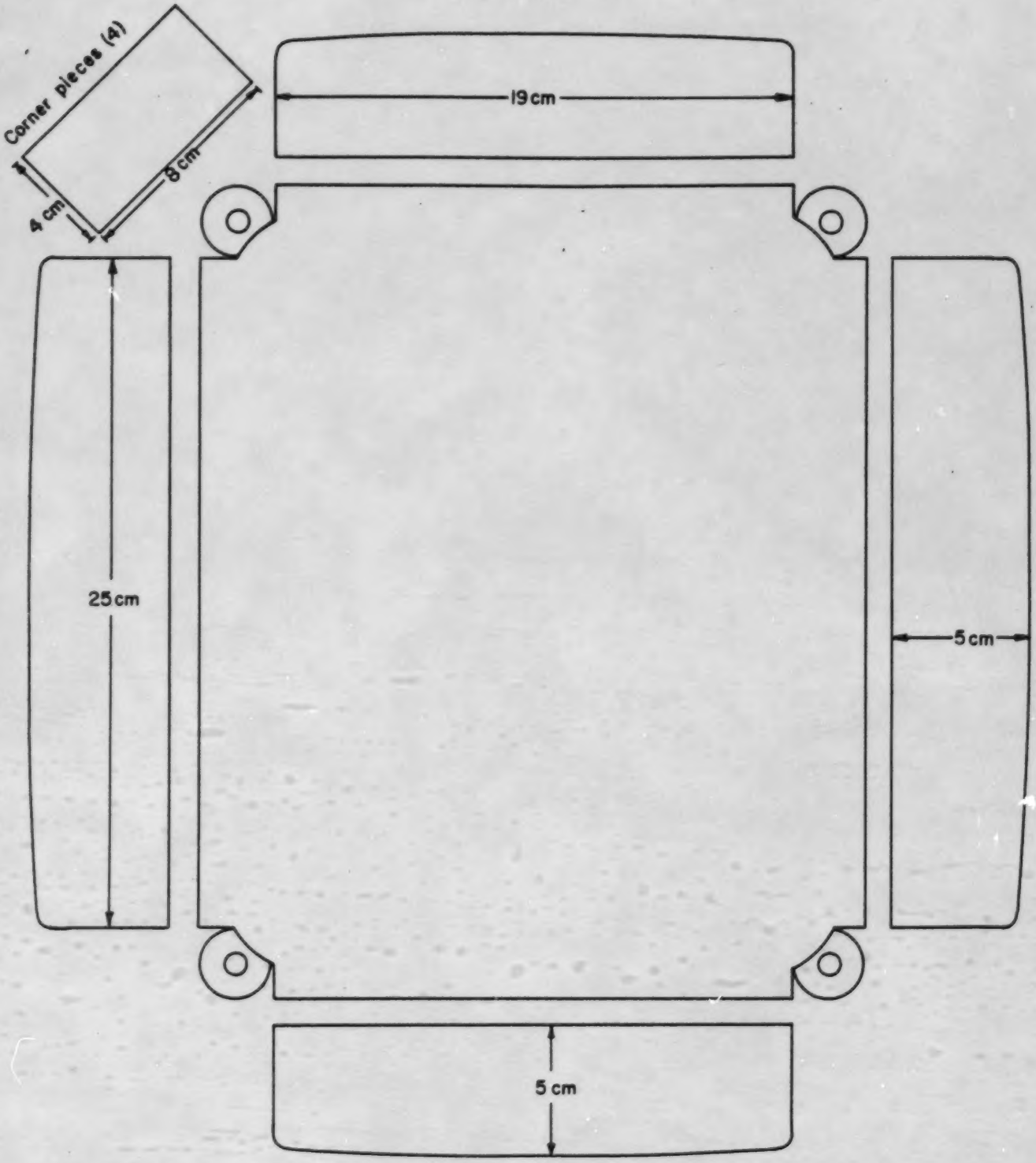


DIAGRAM #4

Scale – 1/2 cm = 1 cm



Appendix I

A SYSTEM FOR THE DEVELOPMENT AND PRESENTATION OF INTERACTIVE VIDEODISC INSTRUCTION

A SYSTEM FOR THE DEVELOPMENT AND PRESENTATION OF INTERACTIVE VIDEODISC INSTRUCTION

Interactive Videodisc for
Special Education Technology
IVSET Project

Project Directors:
Ron Thorkildsen Alan M. Hofmeister

System Programmer:
Russell Awakuni

Manual Prepared by:
Kim Allard Ron Thorkildsen

Exceptional Child Center UMC-68

Utah State University

Logan, Utah

1982

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I. INTRODUCTION

This manual describes and provides a reference for the IVSET (Interactive Videodisc for Special Education Technology) Project Interactive Videodisc Authoring and Instructional Presentation System. The manual is organized into two sections: (1) an overview of the capabilities of the system, and (2) a reference section for users of the system. The overview section provides a description of the overall operations of the system and is useful for both user and the potential user. It provides sufficient information to judge the capabilities of the system and provides the user with a framework for use of the system software. The reference section was designed specifically for the user of the authoring system. It provides detailed information on the use of each of the system components.

The manual is in effect two manuals designed for two different audiences. This results in some redundancy but seems the best format for readers with different needs.

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II. SECTION I - OVERVIEW OF PROGRAMMING AND OPERATION

A. Introduction

A major objective of the IVSET project has been to develop a set of computer programs that could be used with any microcomputer/videodisc instructional program. This set of programs constitutes a general purpose authoring and instructional presentation system for a microcomputer-controlled videodisc system. The system was designed to meet the following criteria:

1. An instructional programmer with little or no computer experience should be able to use the authoring system to write instructional programs.
2. The authoring system should provide the instructional developer with a high degree of flexibility in presenting instruction from the microcomputer and/or the videodisc player.
3. The system should collect data for instructional analysis.
4. A teacher should be able to use the system for instructional purposes with minimal training.
5. The system should summarize student data and present it in a form useful for monitoring student progress.

The authoring and presentation system has been in development for the past three years and has been revised a number of times. The first version was programmed in the PILOT language. PILOT was chosen because it is relatively simple to use and has good graphics capabilities. Three commands were added to the language to allow the microcomputer to communicate with the videodisc player and the light interrupt touch panel used for student input. The PILOT language was later abandoned primarily for three reasons: (1) its execution speed was too slow; (2) although it was relatively easy to use, it still required some programming skill; and (3) it was cumbersome to use when dealing with a large number of instructional segments and response conditions.

It became apparent that a system of computer programs should be developed to overcome these problems. The resulting computer programs were designed by the IVSET project utilizing the BASIC programming language. BASIC was also

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soon abandoned when Pascal became available for the Apple. Pascal is capable of much faster execution speed and its highly structured nature makes software revision much easier. This revision aspect was critical in the testing and revision phase of software development.

B. System Capabilities

The programs which control the videodisc are designed to allow the instructional developer a high degree of flexibility in presenting instruction. In addition to providing a myriad of combinations of instructional presentations, responses, feedbacks and branching strategies, the instructional features of the programming software include the following:

1) The video image can be paused after an instruction of a length of time determined by the developer.

2) An audio sound can be built into the program to call for assistance when encountered.

3) Test items can be identified and responses monitored to determine whether or not a mastery level is achieved. This mastery level is set by the developer.

4) The length of time a student is involved with an instructional session can be predetermined by the teacher.

5) Coordinates for incorrect answers can be stored to provide specific feedback on incorrect responses.

6) Data maintained on student progress includes:
   - starting question number
   - ending question number
   - number and percent of items correct
   - number and length of student session
   - number of times the student did not respond to an item
   - number of times the program signalled for assistance

7) A response length feature can be initiated by the teacher to allow the student a given number of seconds to respond to an instruction.

8) The developer may vary the number of incorrect responses allowed on each question.

9) The source of the video can be programmatically switched to present video from either the videodisc or the computer.

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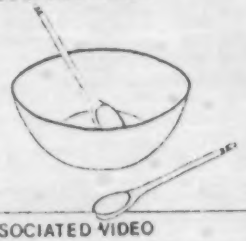
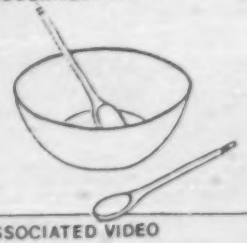
AUDIO	VIDEO	
AUDIO 1: Touch the spoon that is out of the bowl. Yes 3 Right. Yes 4	ASSOCIATED VIDEO 	[X] VIDEODISC [ ] TEXT [ ] GRAPHIC COMMENTS:
AUDIO 2:	ASSOCIATED VIDEO (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	

VIDEO Interactive Videodisc for Special Education Technology

[X] INSTRUCTION [ ] REMEDIATION [ ] TEST [ ] FEEDBACK

QUESTION # 2 3 4

AUDIO	VIDEO	
AUDIO 1: That was a nice try. Watch no. 1 of Sesame Street. Touch the spoon that is out of the bowl. Listen again. Yes 8233 No 8446	ASSOCIATED VIDEO 	[X] VIDEODISC [ ] TEXT [ ] GRAPHIC COMMENTS:
AUDIO 2:	ASSOCIATED VIDEO (NOTE: Video associated with Audio 2 will be the same as video associated with Audio 1 unless graphics from the computer are used to modify the video.)	

VIDEO Interactive Videodisc for Special Education Technology

[ ] INSTRUCTION [X] REMEDIATION [ ] TEST [ ] FEEDBACK

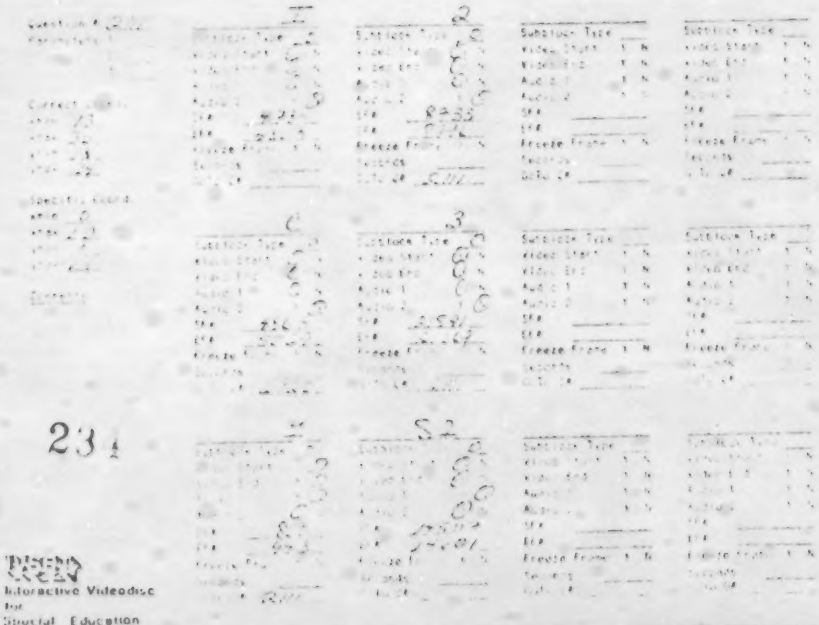
QUESTION # 1

VIDEO Interactive Videodisc for Special Education

FIGURE 1

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10) Graphical and summary formats are available for student progress reporting.

C. The Scripting Process

In order to explain the functions of the authoring system it is necessary to briefly describe the production events that must occur prior to using the system.

After an instructional area has been identified, production of an instructional videodisc program begins by designing instructional sequences in the form of a script. The script addresses both the audio and video aspects of the instructional sequence. Additionally the script must specify:

1. the source of the video (videodisc or computer generated graphics.)
2. the source of the audio (the videodisc has two program selectable audio tracks.)
3. the type of segment (instruction, remediation, test or feedback.)
4. a segment or question number which is unique for each segment, and
5. the actual audio and video content of the segment.

A script sheet has been devised to provide for each of these specifications and content.

Figure 1 illustrates two script sheets representing a segment of instruction and remediation from a program designed to teach directional prepositions. When the instructional segment is presented to the student via the IVSIT system, the bowl and spoons appear on the television screen and the audio "Touch the spoon that's out of the bowl" is presented.

The second script sheet illustrates a remediation segment. The audio is specified under Audio 1 on the form. The video consists of the bowl and spoons plus the image of a teacher touching the spoon out of the bowl. The video teacher might be represented by an actor or a hand puppet.

The entire script for the instructional program is written on the script sheet. Hand written comments (see example in Figure 1) are also written on the sheets to help in directing the actual production. In addition

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to the script, detailed flow charts are prepared to assure the instructional developer that all necessary instructional, remedial and feedback segments are indeed included on the final videodisc.

The final script serves as a production plan. Props must be identified and procured, actors identified and television studio time secured. Prior to studio production, rehearsals are conducted and taped on 3/4" or 1/2" videotape. The videotape is reviewed and necessary revisions are made. If possible, segments of the instruction are tested with an appropriate student.

The next step is to conduct the actual studio production. The entire script including instruction, remediation, feedback and testing segments is taped on 1" videotape. This videotape is then sent to a videodisc manufacturing facility to be converted (pressed) to videodisc. Pioneer Video (formerly DiscoVision Associates) and 3M provide the only service of this type currently available in this country.

D. The Authoring Process

While the videodisc is being pressed or even concurrently with the production process, preparation for using the authoring system begins. (See Figure 2 for a complete flow chart of the authoring process.) At this point, another form referred to as a programming form is used to set up the logic for each instructional segment in the package. Figure 1 also illustrates a completed programming form. Each component of the programming form is briefly described in the following section.

1. The Programming Form

a) Parameters. While all attempts have been made to include a variety of instructional options as part of the authoring software, it was recognized that special situations requiring additional capabilities would be encountered.

To address these special situations, parameters were included in the

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Videodisc Programming Process

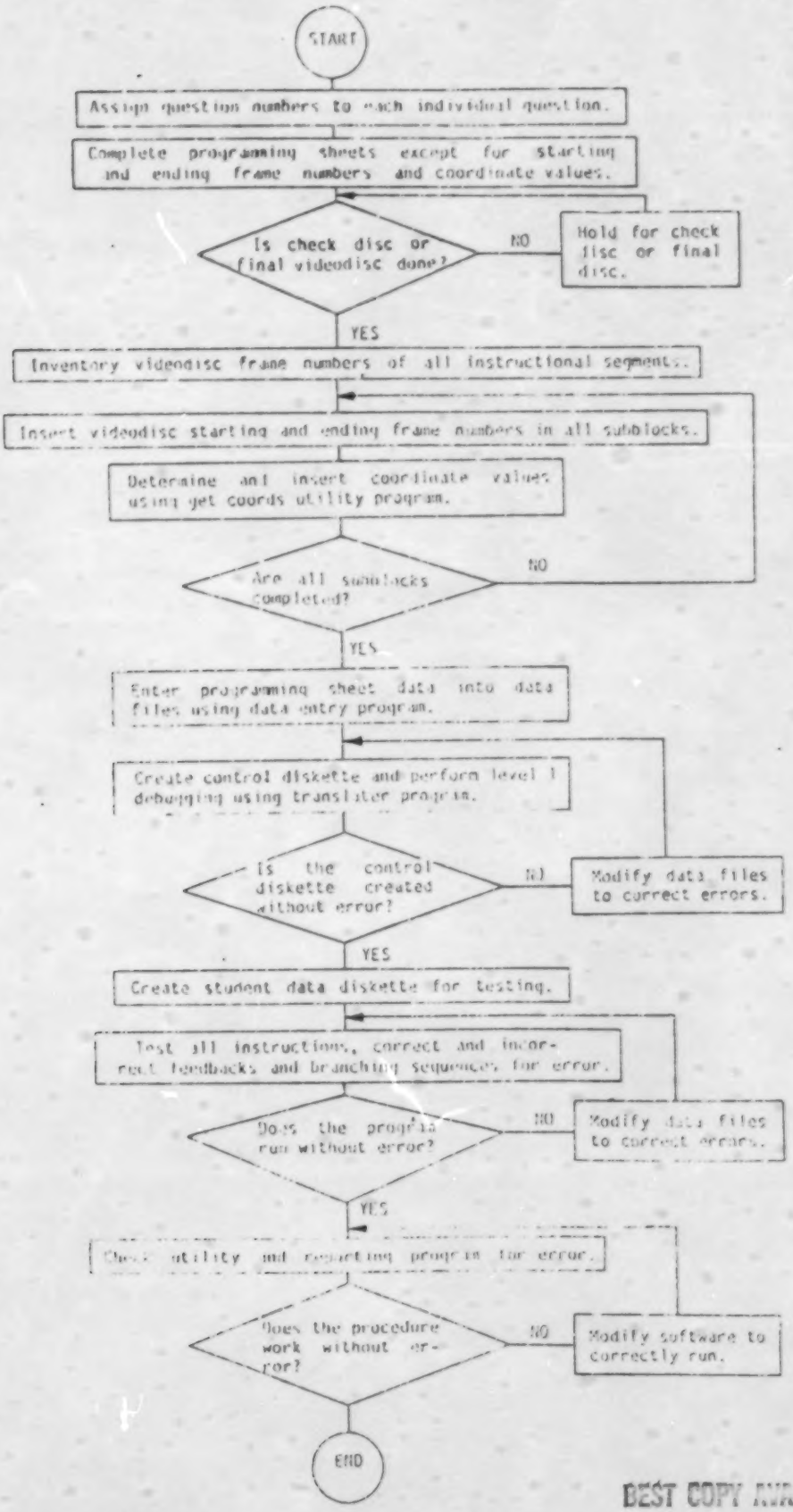
START
Assign question numbers to each individual question.
Complete programming sheets except for starting and ending frame numbers and coordinate values.
Is check disc or final videodisc done?
NO
Hold for check disc or final disc.
YES
Inventory videodisc frame numbers of all instructional segments.
Insert videodisc starting and ending frame numbers in all subblocks.
Determine and insert coordinate values using get coords utility program.
Are all subblocks completed?
NO
YES
Enter programming sheet data into data files using data entry program.
Create control diskette and perform level 1 debugging using translator program.
Is the control diskette created without error?
NO
Modify data files to correct errors.
YES
Create student data diskette for testing.
Test all instructions, correct and incorrect feedbacks and branching sequences for error.
Does the program run without error?
NO
Modify data files to correct errors.
YES
Check utility and recording program for error.
Does the procedure work without error?
NO
Modify software to correctly run.
END

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FIGURE 2

system software. Parameters are simply numerical values which when entered on the programming forms tell the microcomputer/videodisc system to do something differently than it regularly would. Parameters serve several functions for the instructional programmer. For example, parameter values can identify the beginning of a test, indicate the number of responses required to complete the test and indicate the number of incorrect responses a student is allowed before failing a test. Parameters can allow the instructional programmer to vary the number of incorrect responses allowed for a particular instructional segment or instruct the computer to wait or not to wait for a student response. In addition, the parameters are used to instruct the computer to retrieve and present computer produced text or graphics.

b) Subblock Type. Defining subblock types allows the instructional programmer to vary the function of each subblock. By using subblock types, for example, the instructional programmer can present text or skip the videodisc frame encountered.

c) Subblock Identifiers. Subblock identifiers define the function of each subblock. The various subblocks include and instruction subblock, correct, incorrect and specific subblocks. A list of possible subblocks and their identifiers is included in the reference section.

d) GOTO Instruction. The GOTO instruction indicates the next question or instructional segment to be executed after the subblock instructions are completed. Each subblock must contain a GOTO instruction.

e) Video Flags. Video flags are simply indicators which tell the computer whether the video from the videodisc should be shown or not shown. They are used by entering Y (Yes) for video on and N (No) for video off.

f) Audio Flags. Audio flags are indicators which tell the computer whether to play Audio track 1, Audio track 2, or both.

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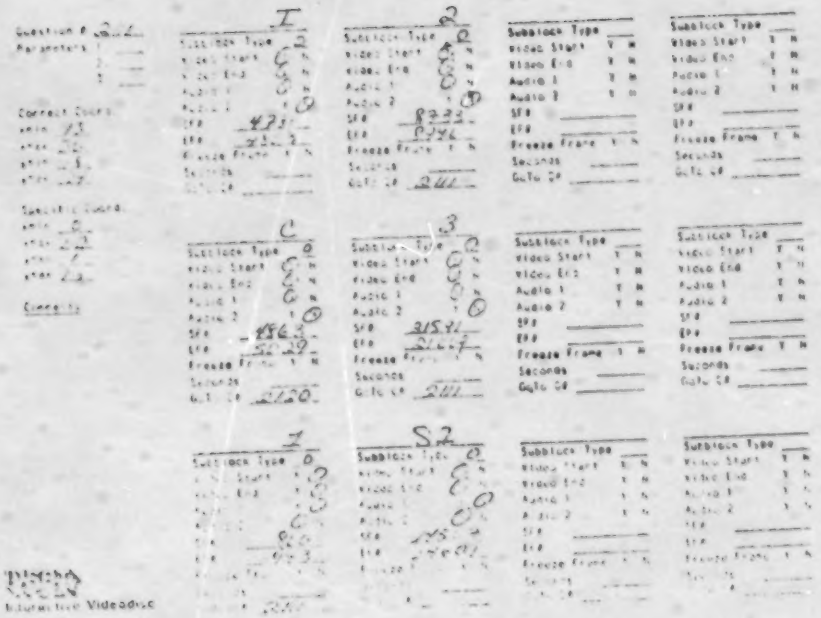
g) Starting and Ending Frame Numbers. Each video frame on the videodisc is individually numbered. The numbers entered in the starting frame number slot tells the videodisc where to begin playing while the number in the ending frame slot is where it will stop playing.

h) Freeze Frames. The freeze frame feature allows the instructional programmer to present a videodisc segment and wait a predetermined time before executing the next instruction. The length of the wait is determined by the instructional programmer.

The programming form shown on the following page (Figure 3) has six of twelve possible subblocks completed. The function of each subblock is explained to the right.

Even before the videodisc is ready, almost all necessary information on the programming form can be completed. The only data not available until the videodisc is returned is the starting and ending frame numbers and the coordinate values.

1. The first subblock, designated by an I, identifies the instruction segment. After this instruction subblock is presented, the system waits for the student to make a response.

2. The second subblock, designated by a C, specifies the consequence of a correct response. In this case the word "right" is presented to the student. The system then presents the next question as indicated in the space labelled GOTO.

3. The next three subblocks, designated by 1, 2, 3, refer to consequences following incorrect responses. After the first incorrect response, subblock 1 presents the words "not right." The question is then repeated as indicated in the GOTO value. The orginal question is repeated again. Subblock 2 presents the statements "That was a nice try. Watch me I am touching the spoon that is out of the bowl. Listen again." If the student responds incorrectly a third time, Subblock 3 activates a buzzer which signals for help from the teacher. It's assumed that help is required after the third incorrect response since the student was given the correct answer after the second incorrect response.

4. The sixth subblock, designated by an S1, specifies the consequence associated with touching the location on the screen identified by the specific coordinates. In this case, if the student touch the spoon in the bowl, the system responds with "No, that is the spoon in the bowl. Touch the spoon out of the bowl." The instruction segment is then repeated.

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2. Entering Programming Data on Diskette

After programming forms have been completed for the entire instructional program, the information on the forms must be stored on a floppy diskette. This procedure requires the use of the Data Entry program. Using this program, information on the programming forms can be transfered to floppy diskette by anyone with a working knowledge of the microcomputer keyboard and some experience handling floppy diskettes. After this information is stored on floppy diskette it is referred to as data files.

3. Debugging Data Files

As with all computer programming endeavors, debugging is a major activity. A program is available from the authoring system to assist in the debugging process. The program scans the data files and checks for errors. This level of debugging is basically concerned with detecting entry errors and missing or illegal parameters.

Second level debugging is very ardous since it involves checking every situation the student might encounter when interacting with the instructional program. The instructional sequencing is checked as well as the appropriatness of feedback. The accuracy of touch panel coordinates and videodisc frame numbers is verified. Debugging is critical to the success of the program since it is anticipated that the student will work independently with the system. Consequently, the instructional developer cannot depend on teacher interpretation of ambiguities or errors in the instruction.

E. Using the System in the Classroom

1. Teacher Prompting

The IVSET software is designed to provide several utilities for the teacher/user when presenting instruction. These utilities are all contained on the master control diskette for each program and are accessible through a main menu appearing each time the system is booted. See Figure 4.

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Upon selecting an option, the teacher/user is prompted through each activity to its completion. Considerable error checking as well as prompting has been built into the program to make it as user friendly as possible.

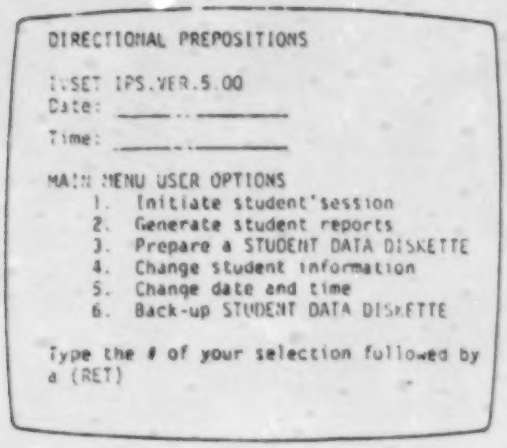
DIRECTIONAL PREPOSITIONS
IVSET IPS.VER.5.00
Date: __-__-____
Time: __:__:__
MAIN MENU USER OPTIONS
1. Initiate student session
2. Generate student reports
3. Prepare a STUDENT DATA DISKETTE
4. Change student information
5. Change date and time
6. Back-up STUDENT DATA DISKETTE
Type the # of your selection followed by a (RET)

FIGURE 4

2. Collecting Student Data

A major project objective was to investigate the feasibility of using the microcomputer/videodisc system with mentally handicapped students. It represents one of the first attempts to provide operational computer assisted instruction (CAI) to nonreaders. The system is unique in this sense, and there is a lack of research knowledge that is directly applicable to developing CAI for this population. Therefore, the developers found it necessary to collect research data about instructional sequencing in addition to data concerning student progress.

Data collection is relatively simple given the large storage capacity of the floppy disk system. Data are collected for each instruction or test segment on the type of response (correct, incorrect, or non-response) and the response time of the student. This becomes a large amount of data since past experience suggests that students using the system respond an average of 8 times per minute. Also maintained on the student data files are the beginning

and ending question or segment numbers for each session and the total elapsed time of the session. The question number, which is unique to each segment, was designed to identify a particular segment, the type of segment (instruction or test question) and the instructional objective of which the segment is a member.

3. Summarizing and Reporting Data

Summarization and reporting is possible by objective and type of question or instructional segment. Four different types of summarizations and report formats are available to the student, teacher, and instructional developer.

1. At the end of a session, the student is presented with a thermometer graph which displays progress by objective.

2. Also at the end of a session the student is presented with a graph indicating the number of session by objectives (see Figure 6.) The graph is displayed on the television screen and is also available in hard copy form.

3. A hard copy listing of every response during a session including the type of response and the time required to respond (see Figure 7.)

4. A hard copy graph which summarizes the activities during each session (see Figure 8.)

STUDENT SUMMARY REPORT

[illegible] Prepositions

Date	Sess	Length sess	Start ques	End ques	Total# given	Total# correct	Total% correct	Total# no-resp	Teach sig
[illegible]/82	1	7	001019	002190	26	19	73	0	0
[illegible]/82	2	8	002190	002010	34	28	82	0	0
[illegible]/82	3	5	002010	003160	17	15	88	0	0
[illegible]/82	4	7	003160	004180	25	18	72	0	0
[illegible]/82	5	8	004180	002010	34	26	76	0	0

Figure 6. This graph is presented on the screen at the end of a session. A hard copy version can also be obtained for the student or teacher.

STUDENT RESPONSE INFORMATION REPORT

Student name JENNIFER
Student number 6

Instructional Package prepositions

1	1	02010	0	5	1	2	02211	0	5
1	1	02020	0	35	1	2	02220	0	48
1	1	02030	0	20	1	2	02230	1	16
1	1	02040	0	4	1	2	02231	0	14
1	1	02050	1	25	1	2	02240	0	28
1	1	02051	0	17	1	2	02250	0	11
1	1	02060	1	35	1	2	02260	0	8
1	1	02061	0	9	1	2	02270	1	3
1	1	02070	0	23	1	2	02271	0	7
1	1	02080	1	47	1	2	02280	0	11
1	1	02081	0	1	1	2	02290	0	8
1	1	02090	0	21	1	2	02300	0	25
1	1	02100	0	23	1	2	02310	0	13
1	1	02110	1	9	1	2	02320	1	10
1	1	02111	0	1	1	2	02321	0	15
1	1	02120	0	15	1	2	02330	0	7
1	1	02130	1	13	1	2	02340	0	13
1	1	02131	1	5	1	2	02350	0	3
1	1	02131	0	3	1	2	02360	0	19
1	1	02140	0	14	1	2	02370	0	4
1	1	02150	0	12	1	2	02380	0	8
1	1	02160	0	11	1	2	02390	1	5
1	1	02170	1	3	1	2	02391	0	12
1	1	02171	0	7	1	2	02400	0	13
1	1	02180	0	16	1	2	02419	0	8
1	1	02190	0	38					
1	2	02191	0	32					
1	2	02200	0	34					
1	2	02210	1	11					

Figure 7. This hard copy report provides information on every response Column 1 identifies the instructional program, column 2 identifies the session number, column 3 is the segment number. The segment number consists of the following: XX--- the objective number, --XX- the segment number with objective number, and ----X the type of segment (instructional or test). Column 4 is the type of response, 0=incorrect, 1=correct, 2=no response. Column 5 indicates the time the learner took to respond to that particular segment.

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STUDENT SESSION INFORMATION REPORT

Student name JENNIFER
Student number 8

Student is initialized for the following packages
1-prepositions
2-
3-

1	1	1/13/82	01019	02190	02190	02190	7	0	0	26	19	7	0
1	2	1/13/82	02190	02010	02010	02010	5	0	0	34	28	6	0
1	3	1/13/82	02010	03160	03160	03160	5	0	0	17	15	2	0
1	1	1/13/82	03160	04180	04180	04180	7	0	0	25	18	7	0
1	2	1/13/82	04180	05010	05010	05010	8	0	0	34	29	8	0

Figure 8. This report provides summary information for each session. The session length is in minutes. The total number presented is the number of segments presented during a session. The teacher signal indicates the number of times the teacher was signaled.

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III. SECTION II - REFERENCE SECTION

A. Introduction

This section is designed to be used as a reference by the user. Each of the computer programs included in the authoring system is briefly described and then the programming process is outlined.

B. IVSET Software

There are two computer programs used in the instructional presentation process or classroom use. They are:

1) EXECUTIVE

2) FORMATTER

There are three computer programs used in the authoring process. They are:

1) COORDINATES

2) DATA ENTRY

3) TRANSLATER

These programs are written in Apple Pascal Release 1.1 and in Apple 6502 assembly language.

C. Instructional Presentation Programs

1. EXECUTIVE - The EXECUTIVE program is used in presenting instruction. It tracks student progress, collects and maintains student data and provides programs to assist the teacher in using the system and interpreting data. The EXECUTIVE program is located on the PACKAGE CONTROL Diskette along with the data files for the instructional program.

The EXECUTIVE program has 3 major sections. They are General Program Management, Report Procedures, and Student Data Management.

a) General Program Management. This section initializes all variables used to execute the EXECUTIVE program. In addition, it checks them to be sure the data files and teacher prompting messages required are located on the diskette. This section of the program also contains the routines used to change the time and data recorded when the system is in use.

b. Report Procedures. The report procedure supplied with the EXECUTIVE program provide a basic student progress report with the option for other information. These reports are the STUDENT SUMMARY REPORT and the STUDENT GRAPH REPORT. The STUDENT SUMMARY REPORT includes information on each student's session. This information includes: 1)session number, 2) session length in minutes, 3) starting question number, 4) ending question number, 5) number of questions presented, 6) number of correct responses, and 7) the percentage of correct responses.

The STUDENT GRAPH REPORT translates the student progress in the instructional program to a graph format. This report as well as the STUDENT SUMMARY REPORT are automatically generated at the end of each student's session.

Other reports available include raw data listing of the student session and response files. These reports are very useful in item analysis.

c. Student Data Management. This section of the EXECUTIVE handles all student data information and maintenance functions. These functions include preparing a STUDENT DATA diskette, changing information that already exists for a student and backing up a STUDENT DATA diskette.

Preparing a STUDENT DATA diskette involves creating data files on a formatted diskette to store the student's session and response data can only be accessed through the report process.

2. FORMATTER - The Formatter program is used to format a new diskette. When diskettes are purchased, they are not readily usable, i.e. the Apple Pascal system cannot access any part of the diskette. To allow this accessibility to the Apple Pascal system, the diskettes have to be put in a format that the Pascal system can recognize. This is done by formatting the diskettes. The result is almost the same as the results of the formatting process through the Apple Pascal Formatter program supplied with the Apple Pascal Language System software except that the process implemented here uses different names for the "blank" diskettes. When the user utilizes this Formatter program he/she has to specify to the program whether the diskette that will be formatted is to be used as a STUDENT DATA DISKETTE or a STUDENT DATA BACKUP DISKETTE.

D. Videodisc Authoring Programs

1. COORDINATES - The Coordinates program is a program designed specifically for the IVSET touch panel configuration. (See IVSET Light Interrupt Touch Panel Installation and Operation). This program is used to determine touch panel coordinate values without having to manually count the amount of LED's on the television screen. Upon entering a videodisc frame number at the keyboard, the videodisc displays that given frame. Touch panel coordinate values are then determined by touching the screen in four locations. The coordinates are displayed on the screen and may then be included on programming sheets for subsequent entry into the data files.

2. DATA ENTRY - The DATA ENTRY program is used to transfer information from the IVSET programming sheets to floppy diskette to create data files. These data files include information specific to individual question, i.e. videodisc frames to play, when to wait for a response, what the coordinate values are and what to do next based on each individual response. Actually, two data files are involved. These are the data files and a cross-reference file of the data file. The cross-reference file allows for quick access into the data file, i.e., instead of the program searching the data file for a particular question, the search is done in the cross-reference file. If the search is successful in finding the particular question then the cross-reference file has pointer that instruct the data entry program where the question is located in the file.

The data files are set up to handle variable length questions. On the programming sheets, some questions or instructional segments use up to as many as 10 subblocks while others use only one or two subblocks. The data files are set up to only use as much space as that particular question needs. In current instructional packages, each question uses between 70 and 200 bytes of storage.

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The Data Entry program has the capability of adding to, changing, and deleting from the data files. The adding process also handles inserting questions between already existing questions on file.

Some degree of error checking is also done on the entered data to insure accuracy in the items that pertain to the question being entered.

3. TRANSLATER - The Translater program takes the data files that have been entered on diskette and performs error checking for accuracy in the data entry process.

The error checking includes:

(1) checking all GOTO values to be sure the GOTO question numbers do exist in the data files.

(2) checking to see if coordinate values exist if the question requires a response.

(3) checking specific feedback blocks and if present checking for their corresponding coordinate values.

(4) checking to see if all necessary subblock have been entered along with their respective "GOTO" values.

(5) checking "yes/no" flags if a subblock is a videodisc control subblock.

(6) verifying that correct parameter values have been entered for each question.

The Translater program also does some space "crunching". This function ensures more efficient use of the space on floppy diskettes.

E. Programming An Interactive Videodisc--An Overview

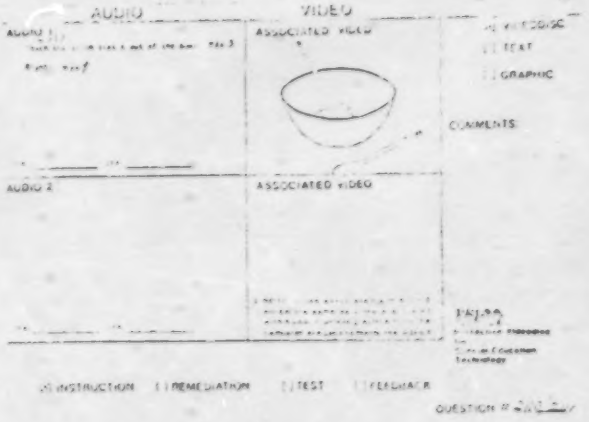
Programming an interactive videodisc using the IVSET software includes establishing question numbers, inventorying the videodisc for frame numbers, cataloging correct coordinates or response evaluation, completing programming sheets for each instructional segment, building data files on diskettes and debugging those data files. The systematic process for programming a videodisc is shown in Figure 2.

As can be seen from the flowchart, preparation for using the authoring system should begin before the videodisc is available. Actually, the programming approach should be well planned before video production begins, however, the preparation of the videodisc itself is beyond the scope of this document. It should be remembered that the videodiscs produced by the IVSET project were designed to be controlled by an external computer via the videodisc player. No program or digital dumps were preplaced on these discs. Programming a videodisc that utilizes the internal microprocessor capabilities of the IVA 7820-3 videodisc player involves a very different process.

Using the IVSET software, an individual with little or no computer programming experience can follow this process to program a videodisc. By completing programming sheets and entering the data in question parameter data files, the instructional designer has control over the interactive presentation of his/her instructional package. This process saves considerable time in coordinating the efforts of the instructional developer and the computer programmer. Based on the instructional demands of individual packages, some system software modifications will be necessary. Changes in the system software should be made by a computer programmer with a working knowledge of Apple Pascal.

1. The Script Sheet

A standardized format for organizing videodisc programming information has been developed. The first component of this format is the script sheet. (See right). The script sheet is general in design. This should allow others involved in interactive videodisc development to use this format. All forms are used in 3-ring binders to facilitate modification.



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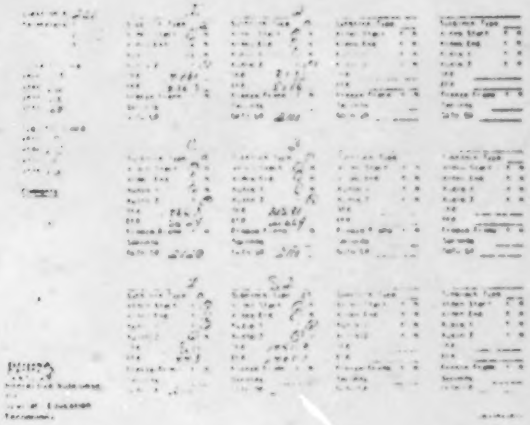
The question or instructional segment number is located in the lower right corner of each form. Spaces for narrative material on AUDIO TRACK 1 is found on the top left of the form while to the right, space is provided to describe the video to be associated with the information on AUDIO TRACK 1. Below AUDIO TRACK 1 is space for narrative and video for associated AUDIO TRACK 2. In addition, spaces to insert starting frame numbers and ending frame numbers are included within the narrative blocks. The IVSIT software is capable of programmatically playing AUDIO TRACK 1 or AUDIO TRACK 2 individually or in unison. Although there is space for video associated with AUDIO TRACK 2, it must be remembered that video from the videodisc for AUDIO TRACK 1 and AUDIO TRACK 2 cannot be disassociated. That is, whatever audio lies on AUDIO TRACK 2 will be associated with the vidoe of AUDIO TRACK 1. The only exception to this is when the video is blanked out or graphics from the microcomputer are used with videodisc audio. The upper right hand corner allows you to define whether you will be using videodisc video, computer generated text or computer graphics. Below the audio description, you may identify the individual question number as instruction, remediation, a test or a feedback segment.

The comment section on the script sheet is reserved for notes on branching logic. Branching logic will vary based on the instructional design of each program. For example, some questions or segments may allow the student additional attempts at a correct response or they may immediately branch to remedial segments.

It should be emphasized that these scripting forms were designed to provide a standardized format from which the videodisc design team can work. They are meant to be flexible enough to be revised for each different application.

2. The Programming Forms

Programming forms provide the format from which the instructional programmer builds the data files. These data files include the information specific to each instructional package. This includes frame numbers, coordinate values, question numbers, video and audio flags as well as branching logic. By specifying on the programming sheet the intended operations the computer will act accordingly. The following describes the programming forms entry by entry.

a) Question or Instructional Segment Numbering. A question or segment number identifies an audio/video instruction or test segment which may or may not require a response. The question or segment numbering scheme allows for easy question identification and modification. In addition, it allows the program to always identify where the student is in the instructional program.

A segment number will consist of at least four digits and possibly five digits. Its value cannot exceed 31,999.

0	1	0	1	(0)
OBJECTIVE (01-31)		INSTRUCTION WITHIN THE OBJECTIVE (00-99)		IDENTIFIER (0-9)

The first two place values in a five digit question number refer to the question's objective number. (See Diagram). For example, the first question in objective #1 could be numbered 01000. The range of the objective number is 1-31 inclusively. This means that an instructional package cannot have more than 31 separately numbered objectives.

The second pair of digits or the third and fourth digits from the left indicate a primary instruction group within an objective. This number can

range from 00-99. When designing questions, keep in mind that this 00-99 range must include all instruction and test segments for the indicated objective.

The last digits or the first digit from the right is an identifier. Identifiers are assigned the following values:

0..... the primary question

1, 2, 3,.. alternate question to the primary question

4, 5, 6, 7 used for inserting one primary question and its alternates.

8..... a signal for the teacher prompt

9..... a test question

For example, all questions or segment numbers in the data files that end in 9 are test items, and any question number ending in 8 will signal the teacher for assistance.

b) Parameters. Because the logic of the EXECUTIVE program cannot take into account all special situations the instructional programmer might encounter, parameters were developed to make the EXECUTIVE function differently. If a parameter value is zero, the logic as specified in the Executive program is executed. If a parameter value is not a zero, the program logic is temporarily modified according to the specific value of the parameter.

Parameters serve a variey of functions for the instructional programmer. For example, parameter values can identify the beginning of a test, indicate the number of responses required in a test and indicate the number of correct responses a student must make in order to pass the test.

Parameters allow the instructional programmer to vary the number of incorrect responses allowed on a given question. In addition, the parameters allow the instructional programmer a great deal of flexibility in designing instruction. The next section describes the parameter values and their function.

If Parameter 1 = 0	then	allow only the number of incorrect responses indicated when the data files were created. In this case, the instruction block is presented as usual and the system waits for a response after the instruction block is presented.
If Parameter 1 = 1	then	instruction block is ignored and the system waits for a response. This feature is used most often when the presentation of the next instructional segment or question is included in the previous correct subblock.
If Parameter 1 = 2	then	the contents of the instruction block are played, but no response is required or waited for. The program goes to the question number indicated in the instruction subblock's GOTO space.
If Parameter 1 = 3	then	a test is being initiated. The contents of the instruction block is presented, but no response is required. To complete the parameter values for a test, Parameter 2 should contain the number of items in the test and Parameter 3 should contain the minimum number of correct items necessary to meet mastery criteria on the test.
If Parameter 1 = 4	then	the teacher assistance signal will sound and the program will go to the question indicated in the GOTO space in the instruction block.
If Parameter 1 = 5	then	the instruction subblock is played as usual and a response is required. The incorrect counter, however, is not updated if an incorrect response is made so after every incorrect response the same subblock labelled 1 will play.
If Parameter 1 = 6	then	the instruction subblock is ignored and the system waits for a response, but the incorrect counter is not updated.
If Parameter 1 = 8	then	the instruction subblock should be ignored and the session should be ended. Whatever question number is entered in the GOTO slot is where the next session should begin. This parameter is used when the instructional session must be ended early to turn the videodisc over before continuing.
If Parameter 1 = 9	then	the session will be ended. This parameter value is used to indicate the completion of the instructional program.

PARAMETER 2

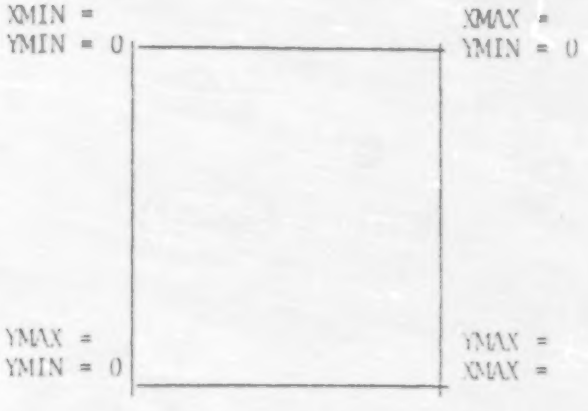
If Parameter 2 = 2	then	the program checks the specific coordinate values. If the specific coordinates match with the student's response, the response is counted as correct. This parameter value allows the programmer to accept more than one correct response. *NOTE: This only applies when Parameter 1 = 0, 1, 5, or 6.
If Parameter 2 = 1	then	the program checks the specific coordinates to see if they match with the student's response. If a match does exist, the response is counted as incorrect. This feature allows the programmer to respond to more than one different incorrect response. *NOTE: This only applies when Parameter 1 = 0, 1, 5, or 6.
If Parameter 2 = 1 and Parameter 1 = 8	then	the instructional sesssion will be ended and the teacher prompted to insert PACKAGE CONTROL DISKETTE #2. (NOTE: This funciton is only used with instructional programs which are so long that they require more than one PACKAGE CONTROL DISKETTE).

PARAMETER 3

If Parameter 3 = N	then	N= the maximum number of incorrect responses allowed on that question. If Parameter 3 = 0 then the number of incorrects when the data entry process was undertaked still stands. This feature is useful when an instructional item requires a different number of incorrect responses than that indicated when data entry was done.

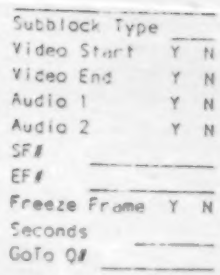
C. Coordinates

Correct and specific coordinates refer to coordinates designated for comparison with responses using the Caroll Manufacturing customized light interrupt touch panel. (See IVSET Light Interrupt Touch Panel Installation and Operation.) A program is included in the authoring software to obtain these values without manually couting LED's (See COORDINATES, page). The coordinates are defined as XMIN, XMAX, YMIN, YMAX values. Their placement on the touch panel is diagrammed below.



Specific coordinates differ from correct coordinates only in what happens when they are chosen. When a place on the screen is touched which falls within the range of the correct coordinates, then the contents or correct subblock on the programming sheet is executed. Usually, this would present some positive feedback. When the response falls with the range of the specific coordinates (if any have been entered), then the contents of the specific subblocks are executed. This allows the instructional programmer to be specific in his/her feedback. For example, the program might respond. "No, that wasn't right. You touched the horse. Touch the house."

d) Subblocks. Each time an individual segment or audio and/or video is presented, the information necessary to present it must be defined as a subblock. The subblocks are the heart of the videodisc presentation.



1) Subblock Identifiers: Subblock identifiers define the function of each subblock. Various subblocks include an instruction subblock, correct subblocks and incorrect subblocks. A complete list of possible subblocks and their identifiers are listed below:

I..... Instruction
C..... Correct
1..... 1st Incorrect
2..... 2nd Incorrect
3..... 3rd Incorrect
4..... 4th Incorrect
S1..... 1st Specific Incorrect
S2..... 2nd Specific Incorrect
S3..... 3rd Specific Incorrect

2) Subblock Type: Defining subblock types allows the instructional programmer to vary the function of each subblock. The subblock types are currently defined from 0-5. The functions of these values are:

Subblock type = 0	then	play videodisc frames and initiate proceeding to location shown in the GOTO value.
Subblock type = 1	then	present defined test and initiate proceeding to location shown in the GOTO value.
Subblock type = 2	then	ignore the videodisc frames and initaite proceeding to location shown in the GOTO value.
Subblock type = 3		is currently not used.
Subblock type = 4	then	play the videodisc frames, assistance initiated the signal and proceed to location shown in the GOTO value.
Subblock type = 5	then	play the procedure which presents text to tell the user to turn the videodisc over, initiate the assistance signal and proceed to location shown in the GOTO value.

3) Video Flags: Video start and video end require a yes or no selection. When the video from the videodisc is to play, both video start and video end should be Y or yes. When the video from the videodisc should be blanked out, the video start and video end flags should both be N or no.

4) Audio Flags: The Audio 1 and Audio 2 flags allow the instructional programmer to select either audio track or both audio tracks programmatically. To play both Audio 1 and Audio 2, both flags should be Y or yes. To play only Audio 1, set the Audio 1 flag to Y and Audio 2 to N and vice versa.

5) Starting and Ending Frame Numbers: The starting frame number is the frame number at which the videodisc segment in the subblock segment should start playing. The ending frame number is the frame at which the segment stops playing.

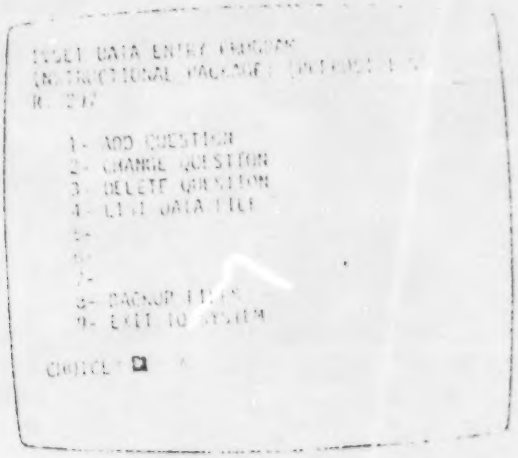
6) Freeze Frame: The freeze frame feature allows the instructional programmer to present a videodisc segment and wait for a given time length before going to the "GOTO" value. The length of this wait is determined by the instructional programmer and should be entered in seconds in the Seconds slot on the programming form.

7) GOTO Question Number: The GOTO tells the computer what segment or question number to go to after each individual subblock is played.

3. Creating Data Files

After programming sheets have been completed, the information on the sheets must be stored on a floppy diskette. This procedure requires the DATA ENTRY programming utility. Using this program, programming sheet data can be entered by anyone with a working knowledge of the microcomputer keyboard and some experience with handling floppy diskettes.

The menu for the DATA ENTRY program allows the user several options. See below.



Basically, the DATA ENTRY program allows the user easy entry and manipulation of data in the data files and store that data on floppy disk.

4. Debugging Data Files

a) Level 1 Debugging: The TRANSLATER program restructures the data files to make them fit more efficiently on the floppy diskette and creates a PACKAGE CONTROL diskette containing both data files and Executive program object codes. This PACKAGE CONTROL diskette can then be used to operate the videodisc system. In addition, the Translater program includes an option to perform Level 1 data file debugging. Level 1 debugging refers to an initial check of the data files for inaccurate or missing information. The errors and omissions the Translater program checks for include:

* Missing "GOTO" values
* Too many "N" flags
* Minimum coordinate values exceeding maximum coordinate values
* Impossible "GOTO" values
* Zero value frame numbers
* Starting frame numbers exceeding ending frame numbers

This Level 1 debugging allows the instructional programmer to make changes and correct typographical errors before actually attempting to execute the program.

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b) Level 2 Debugging: Following level 1 debugging, the instructional programmer is ready to being the arduous task of manually testing all instructional segments and branches for accuracy. For this process, you will need a complete IVSET system, an additional television monitor or receiver and the appropriate cables to hook it up to the microcomputer, a PACKAGE CONTROL DISKETTE, a STUDENT DATA DISKETTE, a complete printout of the package's data files, the original script with frame number inventories and various colored pencils.

During the debugging process, the second video screen will display information on the segments you are working with. The display will look like this:

Indicates which question # is being played	* Question #2010
	NCB = 0 NSB = 3
Indicates parameters for that question	* PARAMETERS: P= 0 P=0 P=1
	SCBOOLS = 0
	SUBPOINTERS: 12 0000 300000
Correct Coordinates	* CORRECT COORDS: 6 29 8 22
	PUSH RETURN TO CONTINUE
Subblock identifiers	* ===== BLOCKTYPE == INSTRUCTION
Subblock type	* SEQUENCE = 1 SUB-TYPE = 0
Position of flags	* BOOLS = 14 YYYNN Flags
	FREEZE = 0
Starting and ending frame numbers	* SF # 182 EF # 1805
	Q #: BL = 0 BP = 0 L = 0
	SUBGOTO: BL = 0 BP = 0 L = 0
Indicates coordinate response	* GETRESP: X = 255 Y = 255
Next question # encountered	======= Question # 2011

The information you will use in debugging is indicated by an asterisk. This debugging process allows you to proceed at your own rate asking for a "Press to Continue" after each question data is presented.

Because the purpose of debugging is to catch flaws in the data files, you must manually take every route through the program just as a learner might. While the best method in which to do this depends on how the data files are structured, we have had success with variations of the following procedure. Proceed through the package once getting every answer correct and following along question by question on your printout. Your printout

(See Figure 11)provides all the information that was entered in on the programming sheets.

Debugging incorrect responses follows the same procedure as debugging correct responses. A major difference, however, is debugging wrong responses takes much longer. Depending upon the number of incorrect responses allowed in the program and the number of errors, debugging wrong responses can take five times longer than debugging correct responses. This is because programs usually give the student who is responding incorrectly feedback as well as repeating the question. This feedback will vary among programs, but generally consists of telling the learner they are wrong and giving them help in responding correctly. If help is not sufficient and the learner is repeatedly responding incorrectly, (usually 3-4 incorrect responses), he/she is generally branched to either a remedial section of the program or to a section with which he/she has had previously met success. This of course, is totally dependant on how the instructional programmer completed the programming sheets to begin with. Not only do these numerous feedback and branching options leave more room for error, they take a great deal more time to check. To do a good job of debugging, more than one person will go through the program several times making corrections. The same printout is often used over and over again by the typist to make corrections. The data file modification process will be expedited if your first set of changes are made using one color and subsequent changes are made using a different color pencil. In addition, a word to the person doing changes to initial all changes as they are made will be helpful. This lets you immediately know which changes have been made as well as helping the typist keep track of his/her progress.

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Instructional Package -- BEGINNING READING Page #133

06 09401 R#323 l=176 c=2 s=6

Parameters	0	1	0	
Correct coords	14	34	18	24
Specific1 coords	27	10	14	14
Specific2 coords	28	14	19	0

	Seq	Type	VS	VE	A1	A1	SF#	EF#	FF	FS	GOTO0#
Instruction	1	0	Y	Y	Y	N	46793	46845	N	0	
Correct	1	0	Y	Y	Y	N	46845	47424	N	0	
Correct	2	0	Y	Y	N	Y	47848	48777	N	0	09408
Specific 1	1	0	Y	Y	Y	N	39601	39880	N	0	09402
Specific 2	1	0	Y	Y	Y	N	39601	39880	N	0	09402
Incorrect 1	1	0	N	N	N	Y	42160	42260	N	0	09402

04 09402 R#526 l=166 c=0 s=6

Parameters	0	0	0	
Correct coords	14	34	18	24

	Seq	Type	VS	VE	A1	A1	SF#	EF#	FF	FS	GOTO0#
Instruction	1	0	Y	Y	Y	N	46793	46845	N	0	
Correct	1	0	Y	Y	Y	N	46845	47424	N	0	
Correct	2	0	Y	Y	N	Y	47848	48777	N	0	09408
Incorrect 2	1	0	Y	Y	N	Y	39601	39823	N	0	09402
Incorrect 3	1	0	Y	Y	Y	N	39881	40104	N	0	09407
Incorrect 4	1	4	N	N	N	Y	42610	42690	N	0	09401

06 09407 R#527 l=94 c=0 s=3

Parameters	1	0	0	
Correct coords	14	34	18	23

	Seq	Type	VS	VE	A1	A1	SF#	EF#	FF	FS	GOTO0#
Instruction	1	0	Y	Y	Y	N	39881	40104	N	0	
Correct	1	2	N	N	N	N			N	0	09402
Incorrect 1	1	4	N	N	N	Y	42610	42690	N	0	09402

FIGURE 11

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